VOL. 173, NO. 6 AMERICAN DECEMBER, 1950

Gas Journal

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Story

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CHAPTER 2

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- **REDUCES SERVICE COSTS.** Many man hours, truck hours and mileage, formerly devoted to the attention of manually adjusted lever and weight regulators, are entirely eliminated. Fisher-King Boosters are completely automatic in operation and in adjusting for fluctuating demand loads.

- **ELIMINATES CONSUMER COMPLAINTS.** Since the Fisher-King Booster always provides adequate pressure in the distribution system, consumer complaints will drop sharply and customer good will is greatly improved.

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FISHER LEADS THE INDUSTRY IN RESEARCH FOR BETTER GAS PRESSURE CONTROL

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Basic Principles

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OIL GAS MACHINE*

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the reactor and checkered chamber
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which principle conforms to the
physical laws of efficient regen-
erator operation.

2 Make ga
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3 A substantial portion of this oil gas is at this point recycled through the reactor. When steam is added it's called "carrier gas." It is this "carrier

* *Work is now in progress on contracted installations of these machines.*

SEMET-SOLVAY ENGINEERING DIVISION
40 RECTOR ST., NEW YORK 6, N. Y.
ALLIED CHEMICAL & DYE CORPORATION

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Fisher-King

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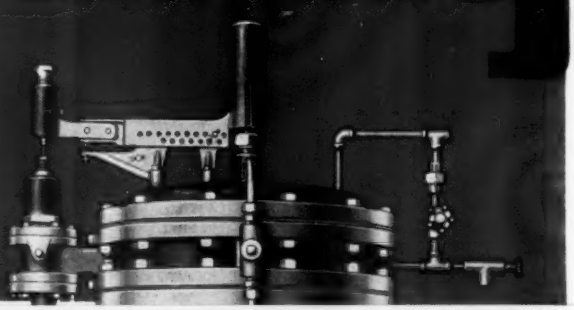
PRESSURE
BOOSTER



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MARSHALLTOWN, IOWA

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Basic Principles

SEMET-SOLVAY REGENERATIVE REVERSE FLOW OIL GAS MACHINE*

1 Make oil is injected downward in the reactor. It is sprayed Counter-Current to the ascending flow of carrier gas which entered the checkerless reactor through an aperture. This aperture develops enough velocity to prevent the passage of oil vapors or carbon into the space below.

2 Make gas descends through the gas fixing chamber insuring controlled heating of gas for fixing the oil gas vapors.

3 A substantial portion of this oil gas is at this point recycled through the reactor. When steam is added it's called "carrier gas." It is this "carrier gas" which drives the gas through the machine.

4 During the make period carbonaceous material deposits on the gas fixing chamber checkers and reactor walls. It burns and regenerators absorb the heat from this and the oil burner. This stored heat is passed on to primary air and uprun carrier gas by the regenerator.

5 These products of combustion descend through the reactor and checkered chamber while the gases requiring preheat ascend, which principle conforms to the physical laws of efficient regenerator operation.

* *Work is now in progress on contracted installations of these machines.*

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ALLIED CHEMICAL & DYE CORPORATION

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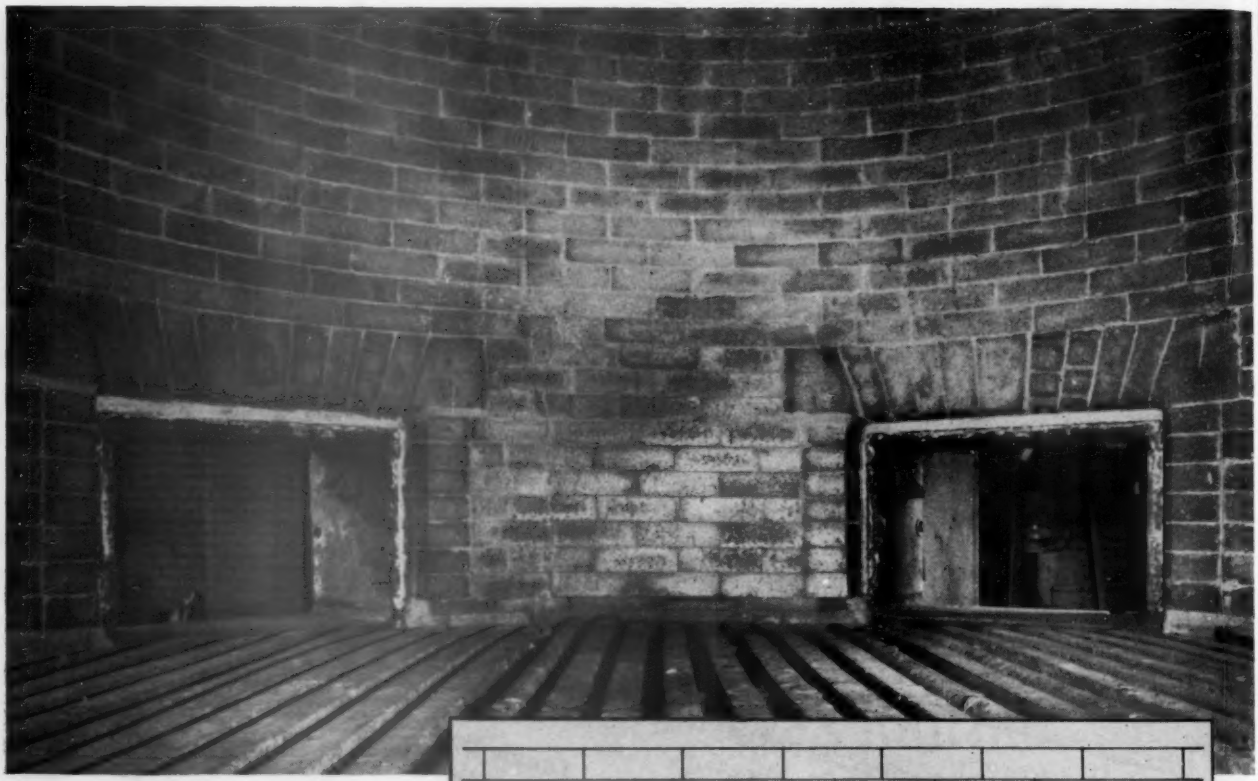

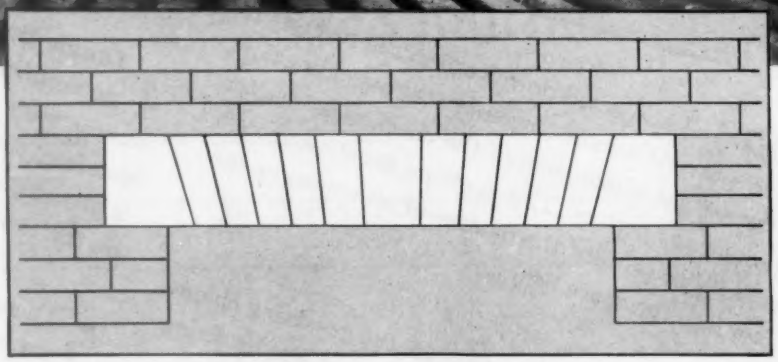

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ESTABLISHED 1859

VOLUME 173 DECEMBER 1950 NUMBER 6

This month...

We commend to the thoughtful consideration of our management readers the news story on page 35, the "Incentive to Vote" plan, inaugurated by the Seattle Gas Company in cooperation with four unions covering the employees of that utility. No good citizen should have to be paid to exercise his right of franchise. But the action of the Seattle company in underwriting a bonus for those who did, is a convincing and unanswerable demonstration of its faith and confidence in the democratic principle of which free elections are the very core.

Some weeks ago we were gently chided by an otherwise enlightened vice-president on our observations in an October editorial in which we predicted a "rugged road ahead for America." He patiently explained that the war was over and we hadn't found it out. For once we wish most humbly and devoutly that we had been wrong.

The book-of-the-month as far as the gas industry is concerned is an intelligently conceived, well written and handsomely designed volume released by the Koppers Company, on "Gas Fundamentals." Upon learning that the book will not be available for widespread distribution, we secured permission to lift much of the material for a series in forthcoming issues of AMERICAN GAS JOURNAL. We predict that it will be of great interest and value, particularly to cadet engineers and the younger members of the gas fraternity. The first section will appear in January.

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Elliott Taylor · Editor

Howard F. Weeks · Associate Editor

Arthur Rohman · Western Editor **John F. Falvey · Financial Editor**

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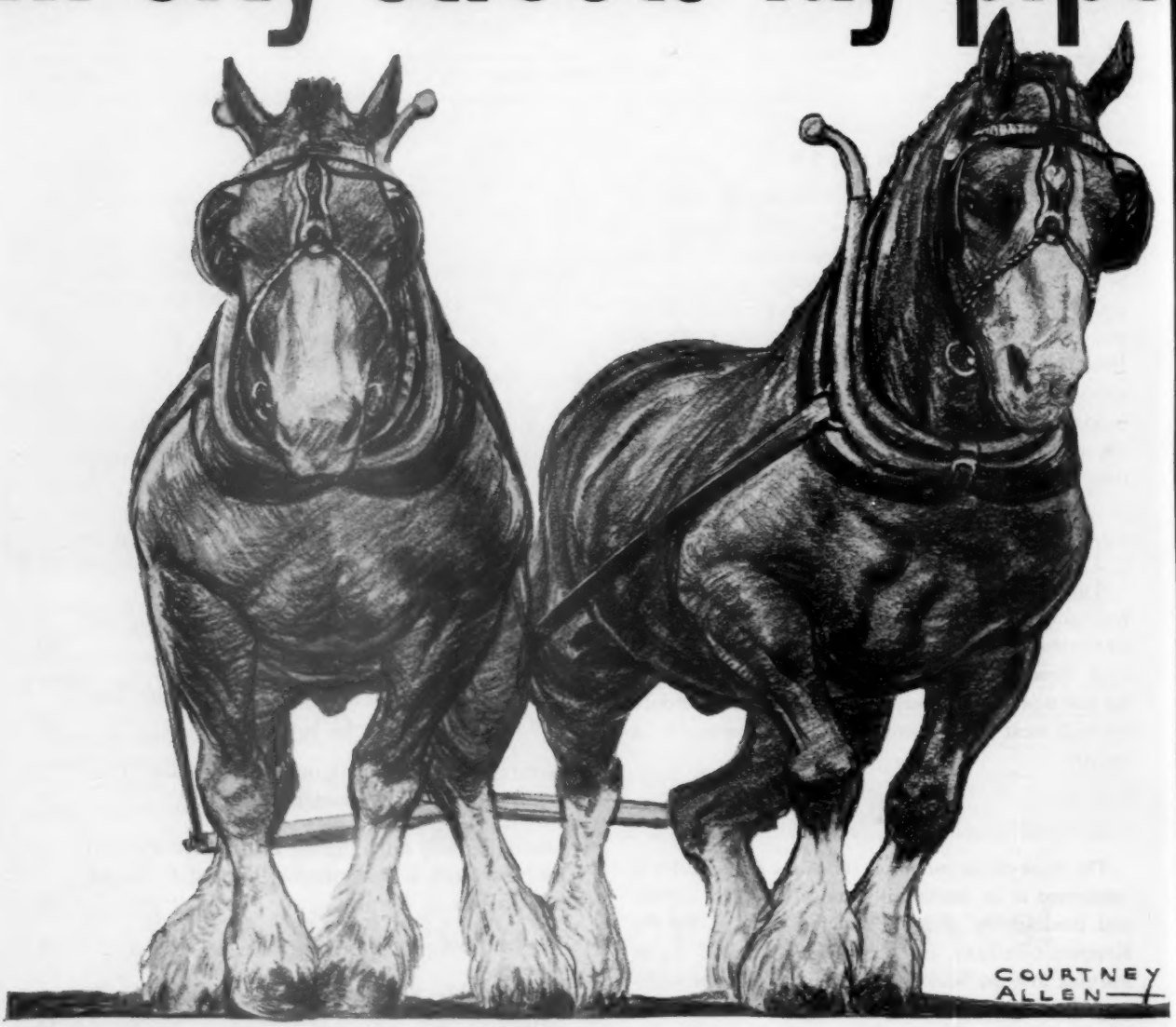
in city streets lay pipe



Like a Clydesdale horse cast iron pipe is known for strength

Known strength factors! Proved resistance to corrosion! These are your only safe and sure guides to long life and low maintenance expense of water, gas and sewer mains laid under costly modern pavements. The four strength factors that pipe must have to survive traffic shocks, heavy external loads, beam stresses and severe working pressures are listed on the page opposite. *No pipe that is deficient in any of these strength factors should ever be laid in paved streets of cities, towns and villages.* Cast iron water and gas mains, laid over a century ago, are serving in the streets of 30 or more cities in North America. These attested service records prove that cast iron pipe not only assures you of effective resistance to corrosion but all the strength factors of long life and economy, as well.

known for STRENGTH

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The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

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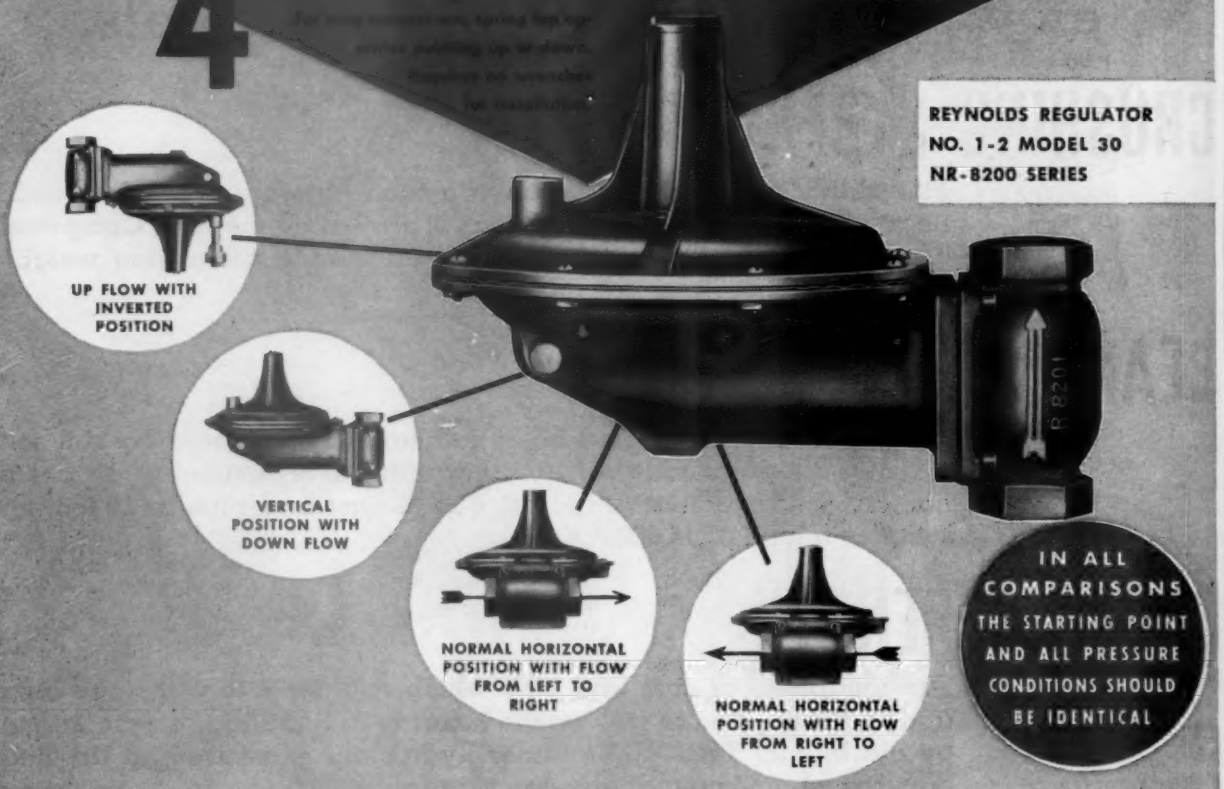
UP FLOW WITH INVERTED POSITION
VERTICAL POSITION WITH DOWN FLOW
NORMAL HORIZONTAL POSITION WITH FLOW FROM LEFT TO RIGHT
NORMAL HORIZONTAL POSITION WITH FLOW FROM RIGHT TO LEFT
B-8201

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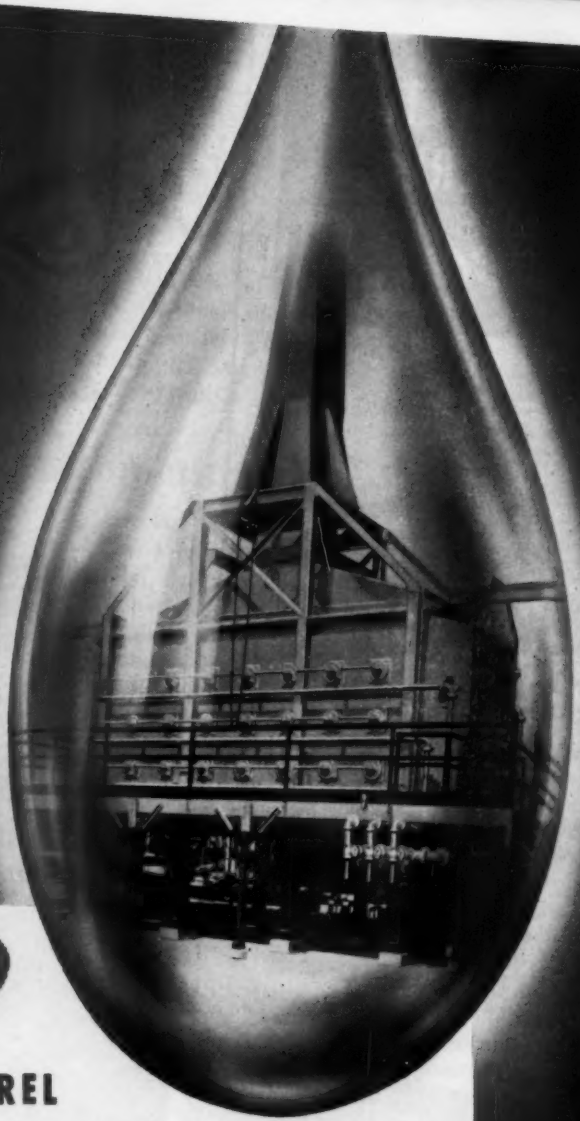

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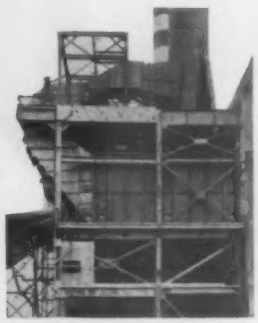

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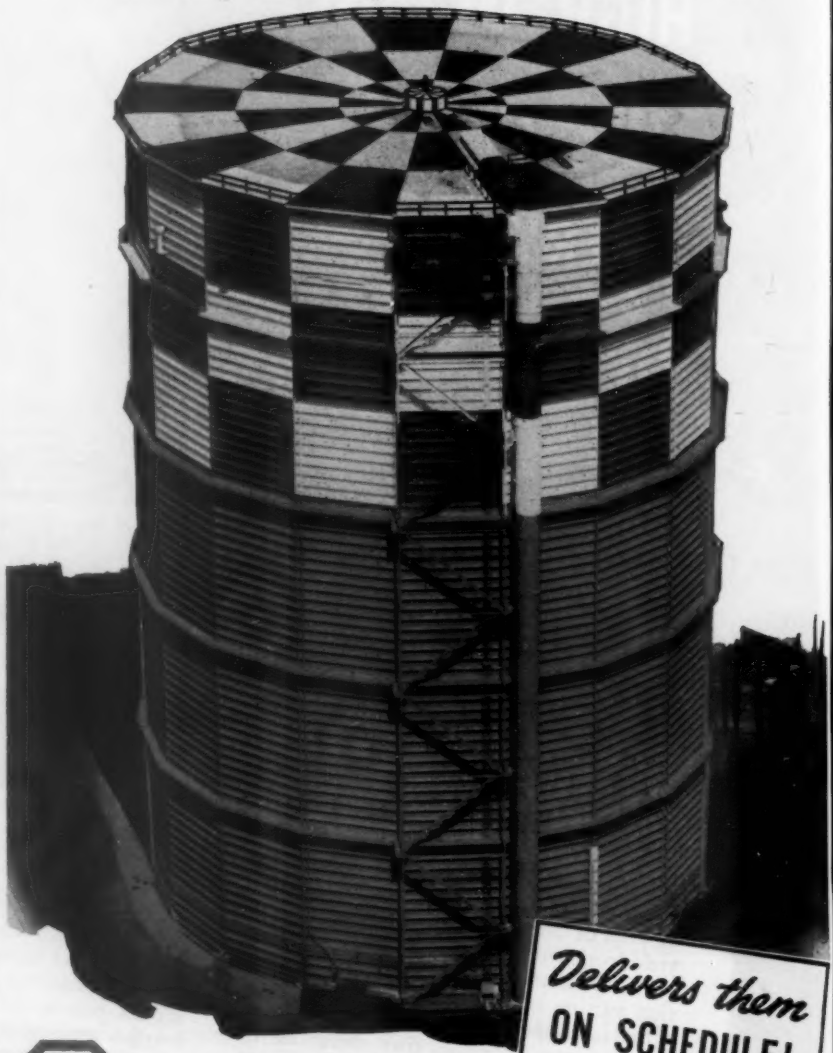

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METAL PRODUCTS DIVISION, BALTIMORE 3, MD.

GAS HOLDERS • ELECTROSTATIC PRECIPITATORS

Editorial:

The Final Frontier

WITH the publication of the Federal Power Commission's Opinion 202, it now appears that natural gas is assured for the New England market through two gas transmission systems—the Algonquin Gas Transmission Company, and the Northeastern Gas Transmission Company. The former will be supplied through the Lines of Texas Eastern Transmission Corp., and the latter by both Tennessee Gas Transmission Co. and Transcontinental Gas Pipe Line Corp.

The wisdom of the FPC in ordering service throughout the territory, so that each company will be put to the expense of building long and expensive laterals to deliver gas to what appear to be some very meagre terminal markets could be questioned. But as far as New England is concerned, the assurance of a natural gas supply within the near future is the consummation of a long deterred but fervent hope.

There remains one more frontier for natural gas that has yet to be invaded, and that is the Pacific Northwest. Despite plans that were first laid nearly three years ago, it now appears that proposals to export natural gas from nearby Alberta into Washington, Oregon and British Columbia are doomed to indefinite postponement. One is hard put to understand the reasoning of the Canadians, who represent themselves as so dollar hungry, in attempting to frustrate plans that would bring them in immediate and substantial revenue from the sale of a natural resource that is presently doing no one any good.

Alberta's politicians represent their motives as being in the interests of assuring an adequate supply for domestic consumption. But we cannot escape the apprehension that individual obstructionists are more interested in getting, each for himself, a slice of the melon that will be cut if United States dollars start rolling into that proud province.

If this is the case, time may well prove that our Canadian brethren have succeeded only in outsmarting themselves. Pacific Northwest Pipeline Corporation's plans to bring gas from Texas into the Portland and Seattle area are well advanced, and officials of the proposed line expect an early certificate from the Federal Power Commission.

While Pacific has tentative plans to lay a feeder line up into Alberta, it is highly improbable that any company would invest in a line to bring gas from the province under the terms that the local legislature has laid down. Laws now on the books provide that the provincial government can prohibit the export of gas at any time if local needs require its consumption at home.

The Pacific Northwest needs natural gas desperately. If supplies are available to the proposed Pacific line, and if steel capacity can still be spared from the rearmament requirements, we believe the Federal Power Commission would be well advised to forget Alberta completely. Events are moving too rapidly for us to permit a vital defense area of the United States to be starved for want of adequate fuel, while the Albertans ponder the problem of what to do with their natural gas.

Competitive Demonstration

AT a recent dinner meeting of the Pennsylvania Natural Gas Men's Association, held in Pittsburgh, we witnessed the best example of a hard hitting competitive demonstration of gas versus electric cooking that has yet come to our attention.

Two ranges—one gas, the other electric—built by the same manufacturer and almost identical in every respect except their sources of heat, were connected to metered supply lines and used side by side. A competent home service demonstrator, with one assistant for each range, took the audience through a step by step demonstration of simultaneous and identical cooking operations on each range.

A unique feature of the show was the fact that the ladies appeared before the audience fully clothed. Having watched other recent demonstrations in which the average American housewife appeared depicted as a 125 pound, 36 inch bust babe in a Deauville bathing suit, we welcomed the return to what, in our humdrum existence, seems to be the more nearly normal domestic dress.

Taking the gas and electric rates prevailing in the area served by the Equitable Gas Company, i.e.: 60 cent 1000 Btu gas and 1.7 cent per kilowatt hour electricity, the demonstrations proved gas top burner cooking to be cheaper by a ratio of six to one, oven roasting four to one, and broiling four and one-half to one.

Speed of performance was another feature accented and attested to by large electric clocks with sweep hands, mounted above each stove, and timing separately every individual cooking operation. Of course, gas won hands down in that one, with top burners shown to be faster by 70 per cent, broiling by 20 per cent and oven roasting by 8 per cent.

We do not know how much of his time Ray Little, general sales manager of Equitable, can devote to outlining in step by step detail the whole plan, patter and running commentary that made up the demonstration. But with the first of the year dealers' meeting scheduled for the near future by many gas companies, we believe they would all of them be well advised to investigate this Pittsburgh package demonstration.

Elliott Taylor

THE GAS ORIFICE METER—1: Principle, Installation, Operation

by L. K. Spink

The Foxboro Co., Foxboro, Mass.

EDITOR'S NOTE

This, the first of two articles on orifice metering, has been prepared exclusively for AMERICAN GAS JOURNAL *in response to specific requests from readers in the new conversion area who are now beginning to receive natural gas for the first time. Part II will discuss the two types of recording instruments used, the mercury type and the mercuryless type of meter, with information on checking and calibrating for perfect operation.*

IF a restriction is placed in a gas line, a pressure drop is produced which bears a definite relationship to rate of flow, and, from this pressure drop, rate of flow can be calculated. This, in layman's language, is the principle upon which the orifice meter is based. The mathematical theory evolves from the conception that potential energy is converted to kinetic energy in passing through the orifice, but this concept is not essential to a working knowledge of the principle.

The usual gas orifice meter is made up of the following elements: The orifice plate which creates the drop in pressure, the flange union or orifice fitting which holds the plate, the inlet and exit pipe which guides the gas properly to and from the orifice plate, straightening vanes if necessary to eliminate swirls and abnormal flow conditions, piping which conveys the upstream and downstream pressures to the recorder, and the recording instrument which subtracts the two pressures and records the difference in terms of inches of water on the chart as the differential pressure, and the pressure element which responds to either upstream or downstream pressure (usually the latter), and records it, usually in pounds per square inch, on the charts. Each of these elements is important to the proper functioning of the meter. These various elements will be discussed in turn.

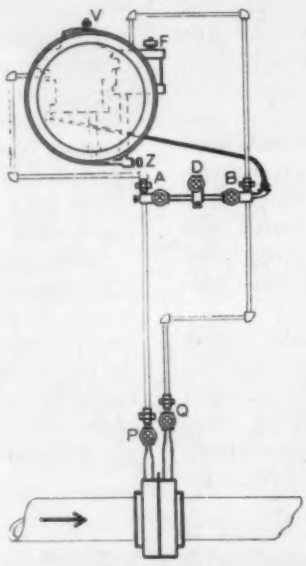
There are many types of restrictions which are used to create the pressure drop; the orifice plate is only one of many. The general term, applied to differential producers of any type, is "primary device."

Primary Devices

Although Venturi tubes, flow nozzles, and Pitot tubes have been used for flow measurement for a great many years, the most common primary device used in the measurement of natural gas is the concentric thin plate sharp-edged orifice. Probably the principal reasons for this choice are: Portability and ease of installation, adaptability to almost any flow range or operating pressure, and proved accuracy.

Helpful References

It is probably safe to say that in the last 25 years more time, effort and money have been spent in establishing accurate coefficient data and installation technique on the orifice plate than on all other types of primary devices put together. Much of this work was carried on under the auspices of the American Gas Association with the assistance, advice, and supervision of the best research groups in the country. Report No. 2 of the AGA Gas Measurement Committee covers the results of their findings up to May 1935. It has the backing of the Bureau of Standards, Bureau of Mines, and the American Society of Mechanical Engineers, and it is regarded by the gas meter engineer as the final authority on all phases of orifice meter measurement. No gas engineer seriously interested in the subject of orifice measurement should be without a copy of this report.



Gas orifice meter flange, piping, and recorder installation.

Report No. 2 of the Gas Measurement Committee leaves many points of interpretation to be settled by the orifice meter user. Several groups have published recommendations on the practical application of this report which will be found extremely helpful.

For instance, the AGA report specifies: "The upstream face of the orifice shall be as flat as can be obtained commercially and shall be perpendicular to the axis of the pipe when in position between the orifice flanges. Since perfect flatness is difficult to obtain, any plate which, when clamped between flanges, does not depart from flatness along any diameter by any more than 0.01 inch per inch of pipe radius shall be considered flat." Report No. 2 of the Practical

Methods Committee of the Appalachian Gas Measurement Short Course, West Virginia University, School of Mines, Morgantown, West Virginia, elaborates on this recommendation with a sketch showing the method of testing the plate for flatness and a table of allowable tolerance in fractions of an inch.

AGA Gas Measurement Committee Report No. 2 gives recommendations for length of approach piping when certain specific sources of flow disturbance precede the orifice. Report No. 3 of the Practical Methods Committee of the Appalachian Gas Measurement Short Course specifies a recommended procedure when several of these disturbances in series precede the orifice plate. Numerous other helpful pointers will be found in these publications.

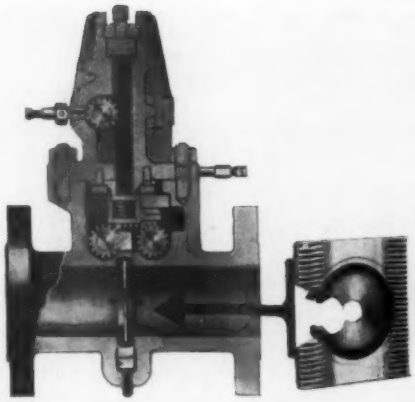
Similar practical methods reports are published by the Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Oklahoma.

Although AGA report No. 2 presents specific data for calculating an instantaneous coefficient, it leaves the meter user to work out his own method of averaging the factors which vary with the instantaneous readings of differential and static pressure. The California Natural Gasoline Association worked out its own practical method of application of Report No. 2 coefficients soon after the issuance of the report in 1935. The method covered by this report has been generally adopted on the West Coast. Their publication initiates a progressive step in recognizing the limitations of the principles of significant figures and eliminating from the calculations meaningless and useless figures which are beyond the accuracy of the data. The mid-continent and eastern gas companies have, for the most part, worked out their own practical methods of application, and although the details of coefficient calculations vary widely among various companies, all arrive at a result which is well within the accuracy of the data.

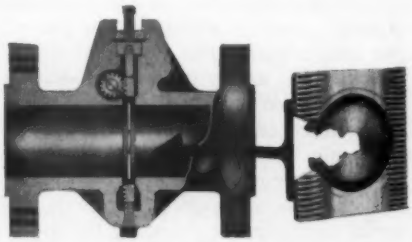
Installation of Orifice Plate and Meter Run

The rules for construction and installation of an accurate orifice meter are simple but must be followed in minute detail. In some cases, wide variations in specifications are allowable, but in other cases, such as orifice edge sharpness, the requirements are so stringent that adequate means for inspection are still being sought.

The AGA report specifies that the upstream edge of the orifice shall be square and sharp so that it will not appreciably reflect a beam of light when viewed without magnification. It shall be maintained in this condition at all times. Moreover, the plate is to be kept clean at all times and free from accumulations of dirt, ice and other extraneous material.



Type A—Daniel senior orifice fitting with dual seal orifice plate. Center valve and gear rack permit removal of orifice plate from line to top chamber whereupon center valve is closed and orifice plate is then removed from top of fitting while the gas is still flowing through the line.



Type B—Daniel junior orifice fitting with dual seal orifice plate. The gear rack permits removal of orifice plate from line after line has been shut down or fitting by-passed. The junior orifice fitting is designed to replace conventional type orifice flange unions and its function is to insure safe methods in orifice plate changes, particularly in large sizes and high pressures.

This specification does not take into consideration the differences in individual vision. A beam of light which may be appreciable to one individual may not be noticeable to another. An auxiliary test which has proved valuable and practical is that of running the thumbnail or fingernail over the orifice edge. It should be sharp enough to scrape the thumbnail like the edge of a sharp skate. A recent development is the Bean orifice edge gauge, advertised by Lovins Engineering Co., Silver Spring, Maryland. This consists of a very delicate and sensitive try square to be laid across the orifice edge. A small flashlight projected on the rear side of this try square should not project a beam of light through at the corner.

It will be observed that the AGA recommendation indicates the need for periodic inspection to check the orifice plate face for a deposit of extraneous material. Orifice fittings which facilitate removal of the orifice plate are available to meet this need. Two types are available: One type (A) which permits removal of the plate without shutting off the line and draining the pressure, and a simpler "dead line" type (B) which compares more closely to the standard bolted orifice flange union but is easier to operate. The latter type permits a slight degree of inspection of the approach and exit sections of the fitting. One company installed meter runs with bolted plates at each end of the meter run, the removal of which permits visual inspection of the approach and exit pipe.

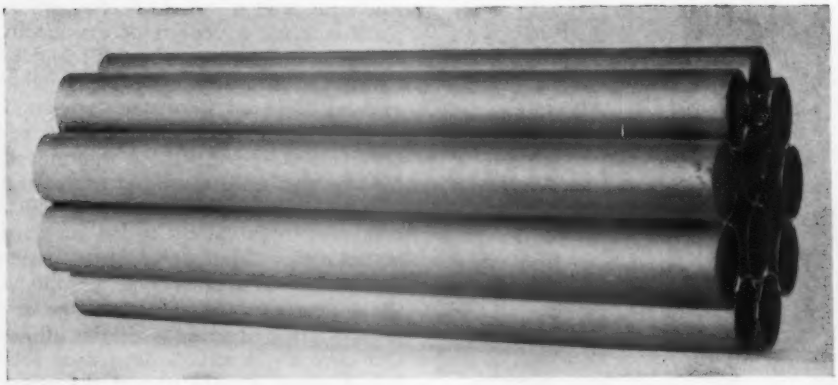
Because many of the specifications for accurate measurement are the responsibility of the manufacturer, purchasing accessory equipment from a responsible supplier is highly desirable. For instance, the maximum thickness of the orifice plate should not exceed 1/30th of the pipe diameter, 1/8th of the orifice diameter, or 1/8th of the difference between the pipe radius or the orifice radius. When greater thickness is required for rigidity, the downstream edge of the orifice should be cut away at an angle of 45° or less to the face of the plate and the inlet side should be properly identified on the tab. The manufacturer also governs the proper centering of the orifice plate in the pipe by maintaining the flange bolt circle diameter, bolt hole diameter, bolt diameter and orifice plate OD as specified by the AGA report. This insures a correct fit of the plate inside the bolt circle and prevents it from slipping to an eccentric position in the pipe.

Flange tap hole locations are the responsibility of the manufacturer; pipe tap locations are the responsibility of the piping fabricator.

Pipe taps at 2½ pipe diameters upstream from the orifice and eight pipe diameters downstream are less common than flange tap meters for the measurement of natural gas in the east. Many mid-continent and western gas companies were standardized on the use of pipe taps before AGA report No. 2 brought out the fact that the coefficient tolerance is greater, the meter run diameter tolerance is closer, and the required length of pipe greater for meters connected in this manner.

Meter Runs

It is good practice to use a meter run size sufficient to handle the anticipated flows with a low ratio of orifice to pipe diameter but to use sufficient length of inlet and exit pipe to permit increase to the maximum of a .75 ratio without violating any of the recommendations of the report. All too frequently gas loads far exceeding any anticipated volumes



Tubular type straightening vane.

are built up soon after the conversion to natural gas, and unless provision is made for this increase of loads in the original design, either good measurement practice is violated by use of an excessive diameter ratio or added expense is incurred by the necessity of installing additional meter runs and meters.

An exit run of five pipe diameters from the downstream tap is adequate in all cases, but the inlet run is dependent upon the type of disturbing fittings and the presence or absence of straightening vanes. Without straightening vanes, the following straight runs are required to insure accurate measurement with a .75 diameter ratio with the specified upstream disturbances: 17 pipe diameters with a single elbow, 22 pipe diameters with two elbows in the same plane, 35½ diameters with two elbows in different planes, 13½ pipe diameters with a reducer preceding the orifice, and 45 pipe diameters with a partially closed valve or regulator. All upstream distances must be increased two pipe diameters when using 2½ and 8 pipe diameter taps.

Vanes

Except in the case of the single elbow and the reducer, the upstream pipe requirements may be considerably reduced by the use of straightening vanes. In the case of the two elbows in the same plane, the distance may be reduced to 14 pipe diameters; for the two elbows in different planes to 15 pipe diameters; and for the partially closed valve regulator 17½ pipe diameters. Seven pipe diameters will usually be adequate to allow between the face of the straightening vane and the orifice plate. If greater spacing is allowed, the total upstream pipe run should be increased by the same amount.

Miscellaneous Precautions

The allowable tolerance in pipe diameter at a .75 diameter ratio is ½ per cent for flange taps and 2/10 per cent for pipe taps from the rated internal diameters of standard weight pipe used in computation of the coefficient tables. Difference between maximum and minimum diameters should also be kept within these limits. Uninterrupted pipe or orifice fitting inlet of this diameter should extend to within ¼″ or less of the orifice plate. The pipe and fitting should be as nearly cylindrical, smooth and free from blisters and scale as can be obtained commercially. Polishing of the meter run is questionable. Preparations are being made at present for tests to determine the possible effects on the meter coefficient of polishing the meter run. When using slip-on type orifice flanges, grinding is frequently necessary to remove the ridge thrown up by the heat of welding at the hub. Pressure tap holes, whether located in the flange at one inch upstream and downstream from the respective faces of the orifice plate or at 2½ diameters upstream and eight pipe diameters downstream, should be drilled through the pipe, burrs removed and the edges slightly rounded. The drill holes should not exceed 1/8 the inside diameter of the pipe in pipe sizes from 2″ to 4″ and ½″ for pipes from 4″ to 8″ inside diameter and 1/16 of inside pipe diameter for pipes over 8″.

Thermometer wells should be placed on the downstream of the orifice not closer to the plate than the allowable exit dimension. An alternative is permitted, however, if straightening vanes are used. In that case, the thermometer well may be located one pipe diameter or more upstream from the vanes.

Straightening vanes, if used, should be constructed with the greatest dimension of the inside cross section of any passage through them not exceeding ¼ the inside diameter of the pipe, and length not less than ten times this greatest dimension.

Meter Piping

It may seem that the differential pressure lead lines which convey the upstream or downstream pressures to the recorder are of little importance, but many metering troubles have been traced to inadequate attention to this detail. Tightness is of paramount importance. A very delicate test for tightness may be performed by locking a differential pressure on the instrument by closing the valves at the flange. A leak in the downstream side of the meter piping will show up as a rapidly increasing differential, whereas a leak in the upstream side will cause a rapid drop in the differential pen reading. Leakage through the bypass manifold is prevented by an open valve between the two shut-off valves.

Liquid deposits pocketing in the differential pressure lead lines are seldom a problem at the discharge end of a long transmission line but may be a very serious problem on meters close to the source of supply of the gas. Whether or not these deposits are to be anticipated, it is good practice to slope the meter lead lines in such a way that any liquids which separate out in the meter piping will drain without blocking the passage back into the flow line.

Gas Rationing & Rate Increases Seen from Excess Profits Tax

The administration proposal for an excess profits tax would result in the rationing of natural gas and a request for a 20 per cent rate increase, William G. Woolfolk, chairman of the American Natural Gas Co., said on Nov. 22 in testimony before the Ways and Means Committee of the House of Representatives at public hearings on excess profits tax legislation.

American Natural Gas Co. is the parent company of the Michigan Consolidated Gas Co., Milwaukee Gas Light Co. and Michigan-Wisconsin Pipe Line Co. It supplies gas to more than 4,000,000 persons in Detroit, Milwaukee and other communities in Michigan and Wisconsin.

Mr. Woolfolk said the most favorable excess profits tax suggestions made by secretary of the treasury Snyder would increase the tax rate on the normal, regulated earnings of the American Natural Gas System from 45 per cent to 63 per cent. He added:

"In this event our system would have to apply for increases of about $16,000,000 (20 per cent) in its charges to the public for utility service to bring its earnings up to a normal return."

Mr. Woolfolk told the committee that a reduction of company earnings by an excess profits tax would make it impossible to finance necessary expansion programs. He said: "If our earnings, regulated by law, are reduced, we cannot raise new money, construction must stop and gas must be rationed."

All illustrations in this article were supplied by Bechtel Corp.

This stockpile was enough for only one day's work on the "Super Inch."

'Super Inch' Pipe Line Is Ready to Serve

PG&E Imports Out-of-State Gas for First Time

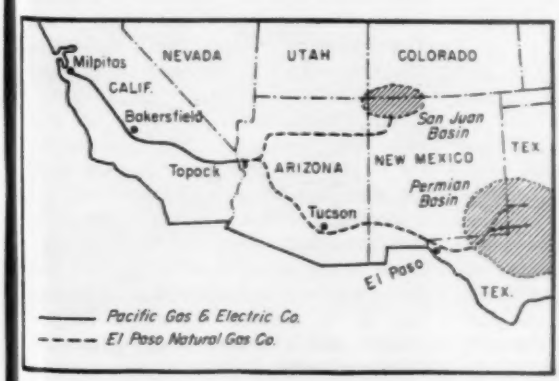
by Staff Correspondent

BEFORE winter weather sets in this year, Pacific Gas and Electric Company's one million gas customers will begin receiving a portion of their supply of natural gas from the Permian Basin of Texas and New Mexico. It will be the first time in the 20-year natural gas service history of northern and central California that PG&E has reached out-of-state to import natural gas.

Construction of PG&E's "Super Inch" gas line, extending 501 miles from the San Francisco Bay Area southeast to Topock on the California-Arizona border near Needles, was completed in mid-November. Following "shakedown runs," the line will be ready for service by the first of the year. At Topock the "Super Inch" joins a new line of the El Paso Natural Gas Co. from the Permian Basin. Next year a second El Paso line, tapping the San Juan Basin located at the four-state corner of New Mexico, Arizona, Utah and Colorado, will be tied in, and the "Super Inch" and its related El Paso transmission system will then extend more than 1600 miles.

First deliveries this winter are to be at the rate of 150,000,000 cu. ft. daily. Next fall, after the San Juan field is connected and PG&E's compressor stations along the "Super Inch" are constructed, deliveries will be stepped up to 400,000,000 cu. ft. daily, amounting to about 45 per cent of the utility company's requirements.

The "Super Inch" project is PG&E's answer to a pincers problem of supply and demand. The availability of supply in California fields is declining on the one hand, and on the other there has been a phenomenal growth in demand stemming principally from the swelling population of the nation's fastest growing state.



Natural gas from Texas and New Mexico will be piped into PG&E's system in Northern California via the 1600 mile "Super Inch." PG&E's 506 mile, 34 inch diameter section of the line is largest diameter line for high pressure transmission.

Natural gas was introduced to the PG&E service area in 1930 following discovery of the Buttonwillow field in 1926 and the famous Kettleman Hills field in 1928. These discoveries promised the first substantial supply of natural gas within reach of the company's market, and some 300 miles of transmission lines were built to connect these fields to the distribution system. By the end of 1930, customers' appliances had been converted for use of natural gas and virtually the entire market was supplied with the new fuel.

The large new natural gas supply was augmented by subsequent discoveries in more than 30 fields in the San Joaquin and Sacramento valleys of California. Outstanding among them is the well-known Rio Vista field, the greatest dry gas field in the West, discovered in June 1936. Other important discoveries included the McDonald Island, Coalinga, Trico and Gill Ranch fields.

Discovery of gas in California apparently has passed the peak, however, for in recent years no major gas fields have been discovered.

Immediately upon the introduction of natural gas to northern and central California, the market commenced a rapid expansion. Natural gas was quickly accepted for many new uses, particularly domestic and commercial heating and industrial processes. By 1940 the demand was treble that of 1930 and the gas had twice the Btu value. Wartime fuel requirements imposed still greater demands and these were kept up by the

postwar industrial activity which still is expanding at a steady clip.

The record of population growth in California tells its own story of increased demand. In the 31 California counties in which PG&E distributes gas, the 1930 population was 2,465,000. By 1940 it had grown to 2,890,000, and by 1950 it had become 4,424,000, increases of 17 per cent and 53 per cent respectively for the two decades. In 1940, PG&E had 658,830 gas customers; in 1950 it had 1,026,512, and trends indicate an increase of about 52,000 annually in 1951 and 1952. The annual volume of gas currently distributed by the company is about seven times as great as that in 1930.

Since the end of the war, the availability of California gas has not kept up with the market. The principal gas utilities supplying Southern California first felt the pinch of insufficient supplies and obtained initial deliveries of out-of-state gas in 1947. PG&E benefited from the importation of this gas, for additional quantities theretofore transmitted to the Southern California companies became available in the San Joaquin Valley fields.

California as a whole consumed 636,741,553,000 cu. ft. of gas in 1949, of which 94,098,642,000 was from out-of-state. Of total supplies, PG&E received 207,007,663,000 cu. ft., an average of 567,000,000 cu. ft. per day. The estimate of the total regular average daily supply for the company during 1950 is 594,000,000 cu. ft., rising to 673,000,000 in 1951 and to 728,000,000 in 1952.

One factor in the declining supply of gas available from California fields for gas companies is the return of gas underground to maintain pressure for maximum oil production. In 1935, when the injection process began, only about ¾ of 1 per cent of the total oil well gas produced was injected underground. Last year, 26.4 per cent of total oil well gas production was returned underground, plus 2,487,311,000 cu. ft. of dry gas. Most of this use of gas was in San Joaquin Valley fields from which PG&E obtains gas. Incomplete figures available for 1950 indicate the injection rate is 10 per cent higher than in 1949. In January, for instance, 404,500,000 cu. ft. per day was injected underground in the state.

Thus it has become necessary for the company to connect new sources of gas. The search began as early as 1944. In 1948 the company commenced purchasing gas from the Southern California Gas Co. and the Southern Counties Gas Co. who then had extra gas available from their Texas and New Mexico imports. During the same year the company entered into an agreement with the El Paso Natural Gas Co. for the purchase of gas to be delivered at the state border from mid-continent sources.

Then began the giant planning project, the selection of a route, the acquisition of rights of way involving more than 2,000 separate transactions, the financing and the construction scheduling. El Paso was to bring the gas to California and deliver it to PG&E at the state line. The company was to build its line from that point to Milpitas, located at the southern tip of San Francisco Bay, where PG&E has its transmission control station for several large mains supplying the metropolitan area around the Bay. The overall project is costing the two companies about $150,000,000. PG&E's share of this investment is approximately $63,300,000.

PG&E's "Super Inch" is an all western construction project. Geneva steel was brought to South San Francisco for fabrication into 34" pipe at the Consolidated Western Steel Corporation plant. Three western construction firms, Bechtel-Conyes-Price, combined to become the general contractor.

The Topock-Milpitas main is 501 miles long and 34 inches in diameter, the largest diameter pipe line ever built for the high-pressure transmission of natural gas. Because of its exceptional size it was nicknamed the "Super Inch." Construction equipment for pipe of this dimension was largely lacking. The terrain to be crossed—mountain ranges, deserts and lush farmlands—presented other problems.

Below—The final clean up for PG&E pipe-bed was made by probably world's smallest bulldozer.

Above—Five and a half foot deep trenches were made by biggest wheel type trencher of its kind.

The El Paso company's construction included additions to its existing trunk main from Eunice, New Mexico, in the Permian Basin, to Blythe, California, together with a branch starting near Salome, Arizona, north to Topock. The total amounts to 628 miles of 30-inch pipe. El Paso also will build 451 miles of 24-inch pipe line from Blanco, New Mexico, in the San Juan Basin to Franconia Junction east to Topock. The existing transmission system includes a 251-mile main from Eunice to Dumas, Texas, and a main extending 91 miles southeast from Jal, New Mexico, to the Benedum Field in Texas, together with shorter gathering lines.

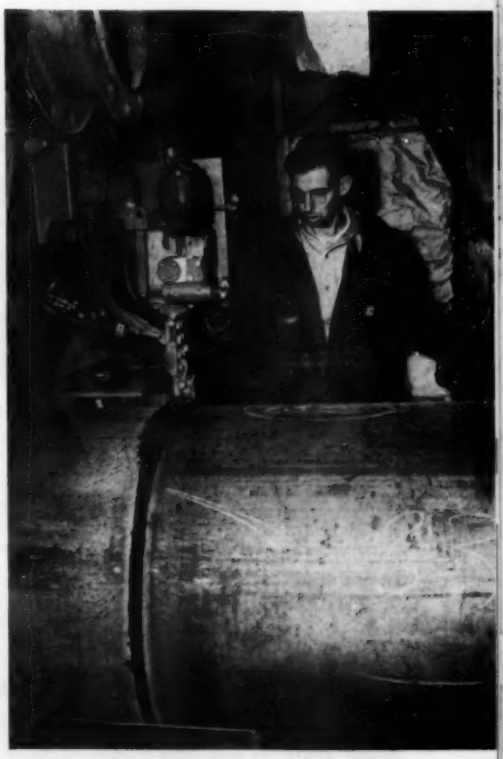
Delivery from this system to PG&E is to be made at the middle of the Colorado River. An abandoned highway bridge was acquired to support the span of 30-inch pipe through which delivery is to be made at mid-stream. The 30-inch pipe extends to the peak of the first hill on the California side, the site of PG&E's Topock compressor station, where the 34-inch "Super Inch" main begins.

PG&E's construction was begun at the northern end of its line in order to put a portion of the main into use at the earliest possible moment. The construction schedule also avoided the winter rains on the northern end and made the crossing of the Mojave Desert possible before the burning summer heat. The first earth was turned on June 29, 1949, in the Panoche Hills 33 miles southeast of Hollister. An 80-mile section of the main running north from that point through Panoche Pass and down through rolling range land to Milpitas control station was completed by early December. A needed additional transmission capacity of 50,000,000 cu. ft. of gas per day from Kettleman Hills to Milpitas was made available by connecting this section of the 34-inch main with PG&E's existing 20-inch "Bay" line.

On completion of this section of the line, men and machines were transferred immediately to Topock. At Barstow, 156 miles west, headquarters were set up for handling rail shipments of pipe from Consolidated's fabricating plant at South San Francisco for delivery along the route between Topock and Bakersfield.

The elevation at point of delivery of the gas on the bridge over the Colorado is approximately 500 feet. The main ascends for the first seven miles through rough, eroded country on the flank of steep, rocky mountains before reaching easier terrain on the route across the Mojave Desert. Climbing gradually, the line reaches 3200 feet elevation approximately 36 miles west of Topock, dips to 800 feet at Amboy, cuts a path through rocky hills at Ludlow and passes Barstow and Mojave. East of Tehachapi it reaches its highest elevation, approximately 4600 feet, in the steep Tehachapi range. In the next 25 miles the line drops sharply through the roughest country of the entire route until it reaches an elevation of only 200 feet on the San Joaquin Valley floor near Arvin. Crossing under the Kern River southwest of Bakersfield, it traverses farm lands and sagebrush plains to Kettleman Hills without rising above 300 feet. For a few miles from Kettleman Hills compressor station it runs near the 20-inch Bay line and the Stanpac line of Standard Pacific Gas Lines, Inc., to their point of separation at Panoche Junction. Thence the 34-inch main ascends the Panoche Hills, along the general route of the Bay line, toward a junction with the 80-mile section completed in 1949.

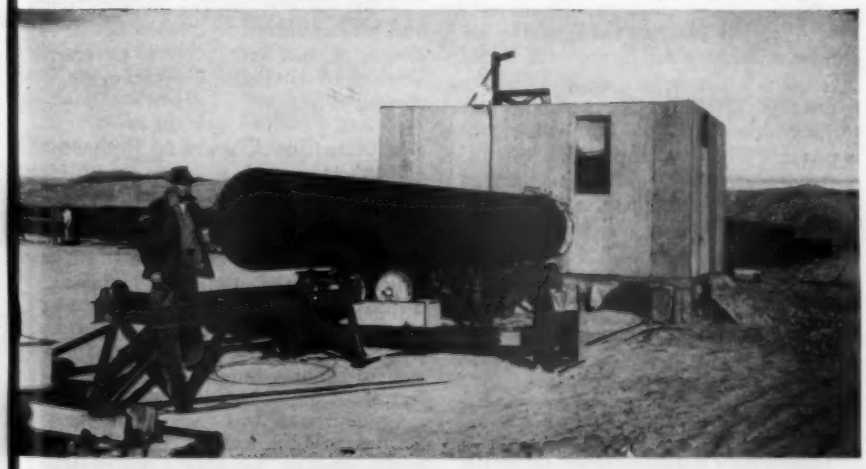
The contest of men and machines against time and terrain in construction of the main required a great amount of equipment, much of which was modified or built especially to accommodate the 34-inch pipe. Bulldozers cleared the route and in hilly or mountainous sections cut numerous access roads to a bench carved 54 feet wide along the right of way. This wide space was needed for passage of the trenching machines and other heavy equipment. In the canyon-cut slopes west of Topock, the rocky Ludlow hills, the steep Tehachapi grade and the rough country of the Panoche Pass, hilltops sometimes had to be leveled and numerous canyon fills were made to avoid sharp bends in the pipe. Where necessary, steel and concrete structures were built across canyons to support the line.



Machine welding at a project yard reduced the amount of slower field welding.

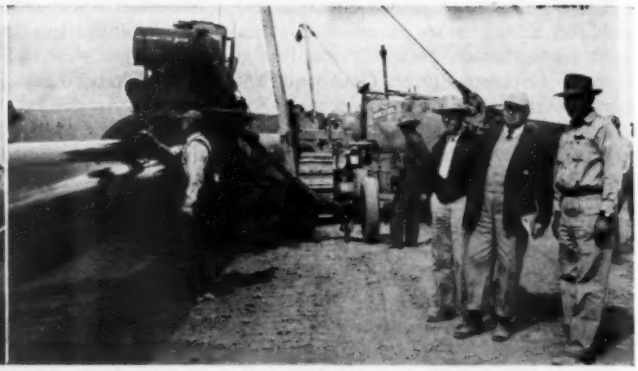
As rapidly as the right of way was cleared, the wheel-type trenching machines followed. Two of these 32½ ton machines were in use. The largest of their type ever built, they opened a trench 44 inches wide and 5½ feet deep at a rate of a mile or more a day apiece. Where the ground was too rocky for the trenching machines, backhoes were used. From east of Ludlow to approximately five miles west, and in parts of the Tehachapi Mountains, even the backhoes were unable to handle the rock, and drilling and blasting were necessary. In these sections soft earth had to be hauled from a distance to protect the wrapping of the pipe in the trench. Down the Tehachapi slope toward Arvin gradients ranging as high as 57 degrees made it necessary to ease the backhoe down with lines from tractors above.

Dust and desert heat imposed hardships on the pipe lining crews and the equipment. Heavy, dust laden winds occasionally hindered operations and at



This building constructed about the automatic welding machine protected the operators and their equipment from strong blasts of wind and sand in the desert.

Two coats of asphalt impregnated kraft paper were applied over a coating of hot tar by this self-propelled machine.



Before being wrapped and lowered into the trenches, the line was cleaned, and a coat of asphalt primer applied.

times work had to be shut down. In order to adapt the actual laying in of the main in desert heat, crews were called to the job long before dawn to make ready the coordinated process of placing long sections of welded, wrapped pipe in the trench so as to be completed before the sun's heat could expand the pipe.

The organization and coordination of a construction project on the scale of the "Super Inch" is a complex task. Over a period of 18 months steel plate from the Geneva plant in Utah was shipped to South San Francisco for fabrication, and then daily, for months, trains of 25 to 40 cars each left the factory loaded with pipe. For the northern 80-mile section, however, all transportation was by truck and trailer. At a project welding yard near Santa Clara two 30-foot lengths of pipe from the factory were welded together by machine before being hauled to the route of the line. On completion of the northern 80 miles, the welding yard was transferred to a railhead location at Barstow for the operations between Topock and Bakersfield. It was set up a third time at Coalinga to handle pipe to be delivered between Bakersfield and the Panoche Hills. At the Barstow and Coalinga stations three 32-foot lengths of pipe were joined or "triple-ended" into 96-foot lengths before being trucked to the line. Machine welding under controlled conditions in the yards greatly hastened the progress of construction by reducing the amount of field welding to be done. This was one of numerous measures taken to accomplish the construction in the shortest time and the most economical manner possible.

The transportation of more than 200,000 tons of pipe, fittings and wrapping materials was involved in construction of the 34-inch main. The hauling contract is reported to have been one of the largest in the history of trucking in California. The Diesel tractors and trailer units used were among equipment modified to handle the exceptional loads. A single 30-foot length of the 34-inch pipe weighs approximately 1½ to 2½ tons, depending upon wall thickness. Also, especially developed was a fork-lift truck capable of lifting as much as 7½ tons at a time in loading and unloading.

The double or triple lengths of pipe delivered to the right of way were field welded into long sections of 2000 to 4000 feet before being lowered into the trench for joining to the main line. The weight of these long sections made necessary the use of teams of sideboom tractors of greater lifting capacity than any manufactured, and available equipment was modified by installing wider axles and heavier counterweights. Before being lowered into the trench, the line was cleaned and wrapped by two self-propelled machines, both of which also were the largest of their type ever made. The wrapping consists of a coating of asphalt, a wrapping of asphalt-impregnated rag felt, a second coating of asphalt and a final wrapping of kraft paper, to a thickness of ¼ inch. Through an area of the Mojave Desert where ground water was encountered close to the surface and pumps were required to keep the trench dry, and in crossings under the Mojave and Kern rivers, additional protection against corrosion was provided.

Delivery of gas to PG&E at Topock will be made at a minimum pressure of 500 pounds per square inch. With deliveries of 150,000,000 cu. ft. per day transmission through the 34-inch pipe is possible without compressors. For the 400,000,000 cu. ft. per day scheduled by the end of 1951, compressor stations will be built at Topock and at Hinkley, near Barstow, and increased compressor capacity will be installed at Kettleman Hills compressor station, with a total compressor capacity of approximately 45,000 horsepower. Seven pressure limiting stations will be incorporated in the line to limit pressures in the sections of pipe of various wall thicknesses.

To maintain a high load factor on the transmission system and supply sources, additional gas storage holders are required to assist in equating supply and demand in the distribution systems. In this connection a program for the construction of seven new storage facilities with capacities aggregating 61,000,000 cu. ft. was begun in 1948.

By imaginative effort and close cooperation among all concerned in building the Topock-Milpitas "Super Inch" main, construction has been achieved ahead of the stated date of first gas deliveries. The last section, a 31-mile link from Panoche Junction toward a connection in the Panoche Hills with the Northern 80 miles, was completed in mid-November. Texas gas already has been admitted to the main as far as Panoche Junction in a series of twelve successive blows for purging the line of air and cleaning out dust and scale. In this process, a small amount of inert, non-explosive gas to act as a wall between the natural gas and the air is admitted to the line below a closed valve behind which pressure has been built up with natural gas. After the valve is opened and the dust-laden air and natural gas have been blown into the atmosphere, a second valve is closed and the additional section of line fills with clean natural gas. This process proceeds section by section.

Some of the purges in the desert and arid countryside created Bikini-like clouds of dust and received nationwide newsphoto coverage as man-made cyclones.

Natural Gas Comes to Richmond Via Commonwealth Natural

Commonwealth Natural Gas Corp. began deliveries of natural gas to the City of Richmond on October 16, according to Erick Larson, President. J. Edward Metzgar, director of the department of public utilities, had everything prepared to go forward with the changeover as soon as the gas entered the first section of the distribution system.

Construction was then begun at the Newport News end of the Commonwealth system, working towards Richmond. A second spread is going south of the James River toward Norfolk.

New England Will Receive Natural Gas During 1951 from Two Companies

NATURAL gas for New England was assured on November 8, when the Federal Power Commission authorized Northeastern Gas Transmission Co. to supply part of the area. The FPC opinion indicated that the rest of the section will be served by Algonquin Gas Transmission Co. if the company shows it has adequate supplies of natural gas.

Three cross country pipe lines will take natural gas to New England. These lines are those of Tennessee Gas Transmission Co., to a point near Pittsfield, Mass., and Transcontinental Gas Pipe Line Corp., to a point near Greenwich, Conn. Both will serve Northeastern, making available, respectively, 156,000,000 and 64,000,000 cu. ft. daily. The third line to serve New England will be that of Texas Eastern Transmission Corp., which will connect with Algonquin at Lambertville, N. J.

Originally, both Northeastern and Algonquin were competitors for the entire New England natural gas market. Early in the fall, FPC announced that the commission desired to have the territory split.

The opinion, FPC No. 202, states:

"Upon full consideration of the record, we believe that two feasible projects to serve New England can be authorized to provide adequate and satisfactory service to the region at a reasonable cost, with a minimum of duplication of facilities and a fair and equitable division of the market. This will give New England the benefit of several sources of natural gas supply, which is highly desirable when we consider that natural gas must be transported approximately 2000 miles before it reaches the New England markets."

The majority finding said in part that "it is still our opinion, that the public interest would best be served through fully coordinated facilities free to secure gas from whatever sources of supply are best able to meet the large ultimate demands of New England for natural gas upon the most favorable terms and conditions." "However," it continued, "in

THE NEW ENGLAND MARKET—PRESENT AND FUTURE

To be served by Northeastern:

	Present Btu	Annual Sales 1949 Mcf	Customers 1949	Fifth Year Requirements of Natural Gas Mcf
CONNECTICUT				
The Connecticut Light & Pr. Co. (Norwalk, Winsted)	528	7,129,757*	87,065*	4,579,115*
The Connecticut Light & Pr. Co.	538	171,492	6,133	685,200
The Connecticut Power Co. (Stamford)	528	1,119,665	16,593	2,723,300
Greenwich Gas Co.	528	428,273	7,544	561,185
Bridgeport Gas Light Co.	530	2,793,867	52,563	5,904,400
Derby Gas & Electric Co.	530	786,384	10,118	371,500
Danbury & Bethel Gas & Electric Light Co.	529	312,160	7,711	256,000
Wallingford Gas Co.	532	156,371	3,273	131,800
New Britain Gas Light Co.	534	633,069	19,621	662,300
* Total for System. See also Algonquin				
MASSACHUSETTS				
Pittsfield Coal Gas Co.	530	591,588	15,107	513,004
Springfield Gas Light Co.	531	2,914,606	62,306	4,625,032
Holyoke Gas & Electric Dept.	535	369,612	15,788	849,840
Fitchburg Gas & Elec. Co.	529	417,594	10,969	703,161
Lynn Gas & Electric Co.	615	1,614,520	42,565	1,709,690
Lowell Gas Co.	660	996,010	27,202	2,641,500
Haverhill Gas Light Co.	532	776,242	19,021	1,122,300
Westfield Gas & Electric Light Dept.	535	153,333	5,021	245,800
Northern Berkshire Gas Co.	535	281,278	10,102	629,028
Northampton Gas Light Co.	533	234,084	8,080	507,751
Worcester County Elec. Co.	535	237,492	8,583	610,939
Spencer Gas Co.	535	18,327	1,085	184,976
Wachusett Electric Co.	666	54,863	2,962	185,869
Leominster Gas Light Co.	532	117,367	5,344	374,051
Athol Gas & Electric Co.	533	36,951	1,654	104,047
Arlington Gas Light Co.	530	1,171,290	27,008	2,097,900
Malden & Melrose Gas Light Co.	539	2,455,754	57,342	4,028,500
Suburban Gas & Elec. Co.	536	467,973	15,462	1,024,900
Salem Gas Light Co.	535	1,012,351	16,438	1,220,896
Beverly Gas & Elec. Co.	539	444,879	10,220	915,036
Gloucester Gas Light Co.	537	169,424	5,853	365,331
Lawrence Gas & Elec. Co.	535	932,002	34,500	1,834,613
Worcester Gas Light Co. (Worcester)	662	4,400,873	63,498	3,847,590
(Framingham)	680			2,565,060
Haverhill Electric Co.	532	76,246	2,615	233,688

To be served by Algonquin:

MASSACHUSETTS				
Brockton Gas Light Co.	532	1,320	29,000	2,223,427
Taunton Gas Light Co.	537	781,107	15,817	907,500
Fall River Gas Works Co.	585	1,336,254	33,929	1,990,300
Cambridge Gas Light Co.	964	2,306,939	50,700	3,228,984
Dedham & Hyde Park Gas Co.	664	531,198	9,560	858,537
New Bedford Gas & Edison Light Co.	667	1,746,449	39,458	3,240,000

(Continued on next page)

view of the limitations upon our authority and the unquestioned desirability of providing service which can be rendered to some parts of the areas in the near future, we shall at this time certificate certain facilities which, upon the record, it has been shown clearly meet some portion of this need, without, however, precluding the ultimate development of a system or systems better adapted to the requirements of New England than those proposed initially by either of the applicants."

On December 1 it was announced that FPC had scheduled further hearings on the applications of Algonquin and Texas Eastern.

The companies which Northeastern is authorized to serve and the companies Algonquin would be authorized to serve are listed on these pages.

The decision also authorized Tennessee Gas Transmission to carry out a $118,643,545 expansion program, part of which will be used to supply Northeastern, a subsidiary of Tennessee.

Also, the decision authorized Transcontinental to extend its facilities to the New York-Connecticut line in order to provide the remainder of the supply to Northeastern, and authorized New York State Natural Gas Corp. and Niagara Mohawk Power Corp. to construct facilities to permit New York State to develop a new storage pool in New York and to permit it to provide additional service to Niagara Mohawk so it can meet additional demands.

Northeastern, under the order, is authorized to serve certain markets in Connecticut, Massachusetts and New Hampshire from connections with Tennessee's system near Pittsfield, and Transcontinental's system near Greenwich. Companies which Northeastern is authorized to supply have estimated peak day requirements in the fifth year of 207 million cu. ft. and total estimated annual requirements for that year of 47 billion cu. ft. Tennessee will supply 156 million cu. ft. per day of this total, and Transcontinental 64 million per day.

The remaining markets in the New England area, the commission said, will provide an economic system for Algonquin, which has presented evidence in support of its application, except as to gas supply. Algonquin's customers would also be in parts of Massachusetts and Connecticut, as well as in Rhode Island and one company in New Jersey. The total estimated peak day requirements of these customers in the fifth year are 184 million cu. ft. and total estimated annual requirements for the same year 40 billion cu. ft.

The authorization is conditioned on the companies establishing inter-connections with, and entering into agreements for emergency inter-change of gas with any natural gas system or systems serving the New England area at wholesale.

Tennessee's authorization will increase its system capacity by 250,000,000 cu. ft. per day to a total of 1,310,000,000 cu. ft. daily, and includes a 303-mile main line extension from the eastern terminus of its authorized Kentucky-to-Buffalo line to the point of connection with Northeastern. The company also is authorized to build a 786.6-mile loop along its existing line, install additional compressor capacity and construct about 75 miles of lateral line.

Tennessee's additional 250 million daily capacity increase will be divided as follows: to United Fuel Gas Co., 25 million; Inland Gas Corp., 20 million; Godfrey L. Cabot, Inc., 5 million; New York State Natural, 15 million; and Northeastern, 156 million.

In addition to the 64-million cu. ft. per day Transcontinental is authorized to serve to Northeastern, the former also is authorized in this decision to make available to Philadelphia Gas Works Co. an additional 15 million cu. ft. per day.

To be served by Algonquin, continued:

	Btu	Annual Sales 1949 Mcf	Customers 1949	Fifth Year Requirements of Natural Gas Mcf
Plymouth Gas Light Co.	516	75,599	2,484	117,200
Milford Gas Light Co.	660	88,373	2,584	85,498
Boston Consolidated Gas Co.	534	16,623,345	312,551	8,001,000
Old Colony Gas Co.	536	907,156	19,244	956,067
Buzzards Bay Gas Co.	528	248,419	6,504	735,296
Norwood Gas Co.	529	129,988	3,308	332,107
RHODE ISLAND				
Blackstone Valley Gas & Electric Co.	514	1,971,517	48,151	2,720,920
Providence Gas Co.	510	4,075,554	101,234	4,311,000
Newport Gas Light Co.	506	419,658	8,122	634,289
Narragansett Electric Co. (Westerly)	810	249,023	6,728	269,211
(Bristol-Warren)				348,877
CONNECTICUT				
The Connecticut Power Co. (New London)	538	369,355	8,296	481,200
The Connecticut Light & Power Co. (Waterbury, New Haven, Willimantic, Putnam, see also Northeastern)	528	7,129,757*	87,065*	4,579,115*
New Haven Gas Light Co.	530	4,016,756	74,666	1,756,579
Mystic Power Co.	510	38,871	1,196	134,663
Hartford Gas Co.	528	3,578,542	64,555	2,184,700
Norwich Gas & Elec. Dept.	530	303,838	7,163	425,516
NEW JERSEY				
Jersey Central Power & Light Co.	529	2,868,036	51,283	439,900

* Total for system.

FPC Directs Panhandle Eastern To Supply Michigan Gas Co.

The Federal Power Commission has authorized Southeastern Michigan Gas Co. of Port Huron, Mich., to construct natural gas pipe line facilities to serve the southeastern Michigan area, and directed Panhandle Eastern Pipe Line Co., of Kansas City, to supply five million cu. ft. of gas per day to the Michigan company, subject to 100 per cent curtailment during the coming winter.

FPC Examiner Favors Piedmont For Part of Carolina Market

Federal Power Commission Presiding Examiner Edward B. Marsh has filed an initial decision, subject to review by the Commission, which would authorize Piedmont Natural Gas Co., of Spartanburg, S. C., to serve natural gas markets in North and South Carolina by constructing a series of lateral pipe lines extending from connections with the system of Transcontinental Gas Pipe Line Corp.

The examiner's decision also would authorize Transcontinental to increase the capacity of its Texas-to-New York City pipe line by 50 million cu. ft. per day, up to 22 million cu. ft. of which would be delivered to Piedmont.

Applications of two other companies which were competing with Piedmont for the Carolina markets were denied insofar as they relate to serving the markets Piedmont was authorized to supply. However, the proceedings involving these two companies—Carolina Natural Gas Corp., of Charlotte, N. C., and Public Service Co. of North Carolina, of Gastonia, N. C.—were ordered reopened to afford those companies an opportunity to file amendments to their applications eliminating the communities which Piedmont was authorized to serve.

Piedmont's project includes six lateral lines, aggregating 73.7 miles, to serve the following communities: Charlotte, Winston-Salem, Greensboro, Salisbury, High Point and Burlington, N. C.; and Greenville and Spartanburg, S. C. Estimated cost of the project is $1,200,000.

The Coke Oven Will Remain a Factor In a War or a Peace Economy

by W. Reed Morris

Consultant, Koppers Company, Inc., New York

W. Reed Morris

WHILE there are numerous materials desired for the successful conduct of war, the demands or requirements change when new and better materials are developed. Up-to-date, steel is a top rank essential, and nothing has been found which will fill its place. Coke and, therefore, the coke oven, is fundamental to the production of steel, and our object is to give an up-to-date analysis or appraisal of that industry, and show how it fits into the national materials' puzzle.

Understanding of its place in our economy, either at war or in peace, requires more than a knowledge of what a coke oven is and what it produces. It is allied and essential to the production of so many important materials that a clear understanding must include basic facts about the production of gas other than coal gas, as well as the place of coke in steel production, the use of coal distillates in the chemical field, and how other products fill important industrial requirements.

Over the past forty years coke ovens have been built by practically all steel plants, and, also, most large centers of population turned to the coke oven for a supply of base-load gas. The deciding reason for the development of the merchant coke oven was because it supplied the cheapest form of gas which could be produced. In 1947, about 180 billion cu. ft. of coal gas went into the domestic gas business, almost half the total. Water gas, with its lower investment cost and greater flexibility for meeting quick changes and peak loads, supplied most of the balance of manufactured gas.

The incentive for building and enlarging, and in some cases even maintaining coke ovens for the purpose of producing coal gas for domestic use, is now decreasing with the enlarged distribution of natural gas. The same holds for water gas; today's prices of coal and oil for gas making compare unfavorably with the cost of natural gas in many places, and gives at least a temporary answer to what procedure or practice will be followed. Gas from Texas and contiguous areas is delivered one or two thousand miles distant at approximately 1¢ to 4¢ per therm. How long those non-competitive prices will hold is a moot question, as is also the question of duration of supply.

Certain it is, today's prices and indicated supply are favorable in the foreseeable future. At the same time it may happen quicker than we think that coal and oil will price themselves to a more competitive market position. How drastic the changes have been in the last ten years is shown by the fact that coal and oil have increased in price 70 to 80 per cent or more, while natural gas retail prices have decreased approximately eight per cent. The failure of coal to maintain its position in the power field does not seem logical from the standpoint of long-range planning of the best use of national resources, but industry has no alternative, and, therefore, follows the trend.

In gas manufacturing circles the coke oven means a source of coal gas for domestic and industrial use, and coke for making water gas. The metallurgical industry is principally interested in coke for smelting and ore reduction, but of late is giving significant recognition to the importance and value of other ma-

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"Pushing an oven" is dramatic and colorful.

Presented at annual meeting of American Gas Ass'n, Atlantic City, Oct. 2-5.

terials resulting from the distillation of coal.

In addition to coke and gas, other important products of the coke oven are tar, benzol, toluol, xylol, naphthalene, pyridine and ammonia, all of utmost importance to our national economy in peacetime and are absolute necessities for national defense.

It is needless to say that in the event of another war coal chemicals will play an even greater part than they did in World War II. They have already proved their worth and their necessity to our civilian economy, as without these items we would not have the present scope rubber program, plastics, many of our insecticides, medicinals, etc.

We also wish to add the contribution made to our increasing food supplies by the use of ammonium sulphate as a primary source of nitrogen in the fertilizer field.

The upward trend in the coal chemicals field has reversed our thinking to the extent that the term or name "by-product" is a misnomer and its use is being discontinued. The size of the coke oven or coal chemicals industry in this country is shown by the fact that 100 million or more tons of coal are processed each year. The industry has become the largest user of bituminous coal. Reports of the U. S. Department of the Interior tell that the value of the products and the sale of materials of coke oven plants in the United States has, for several years, exceeded one billion dollars.

Next to coke, gas is the most important product by weight and from the value standpoint. From the 100 million tons of coal carbonized there is produced at least a trillion cubic feet of gas, of which only a small percentage, perhaps 15 or 20, goes into domestic or home use. It is a tremendous reserve of gas production which in time can and may be shifted from the industrial to the more lucrative domestic market. At the moment there is somewhat of a lull in the construction of merchant or gas coke oven plants; however, the total carbonization of coal is not decreasing —it is increasing. Coke oven plants are being built regardless of whether the gas goes into the domestic field or not. The upswing in steel output requires more coke and automatically there is a proportionate increase in production of coal gas. The centers of production may change but still the coke oven can easily become a major source of domestic gas supply.

Coke Requirements

An estimate of the coke situation in the United States, as of January 1, 1951, indicates a total requirement of coke at that time of over 77 million tons. If beehive coke can be increased to 5½ million tons per year there would be a small amount of coke, perhaps ½ million tons available for domestic heating. In the table on page 21 it is assumed that the blast furnace capacity of the country will operate at 100 per cent. As of August 15th it is operating at about 95 per cent capacity, which is supporting a 100 per cent capacity steel production. It is taking all the coke we can make today to operate our blast furnaces at 95 per cent capacity. The additional required coke might come from another two million tons of beehive ovens and perhaps another one million tons of oven coke made available by the decline in water gas coke requirements. It should be pointed out, however, that this tonnage of coke, if available, would involve a terrific amount of cross-hauling.

We can be reasonably sure, too, that following the pattern of the last five years, there will not be a net gain of all the capacity scheduled to come in this year. History indicates that we gain but about one third of our newly installed capacity due to the abandonment of over-age ovens. National Security Resources Board has men in the field now investigating this problem, plant by plant, and there should be definite information within the next six months as to what we can expect in the way of oven capacities during the next five years.

We Need All

Mr. Weiss, executive secretary of the American Coke and Coal Chemicals Institute, says: "Experience indicates that we need the installation of at least three million tons of coke capacity each year to keep up with obsolescence, basing the age of an oven at 25 years. We have not been building ovens at this rate. One thing is incontrovertible, for our national welfare—*We Cannot Afford Now to Lose a Single Pound of Coke-Making Capacity at Any Merchant or Utility Coke Plant.*"

Forty years ago practically all coke for steel production came from beehive ovens. In 1910, from a total production of 41.7 million tons of coke, 34.6 million was beehive coke, and 7.1 million oven coke. In 1948, we find a very different condition. Out of a total production of 74.9 million tons, 6.6 million tons was beehive coke and 68.3 million oven coke. The coke oven, with its recovery of practically every thing contained in bituminous coal, was well on its way before the first World War. Promoted by the demands of the war, plants were built as rapidly as possible, and in ten years the production of oven coke increased from seven million tons to 31 million tons. In the 1930's, beehive coke declined to only one or two per cent of the total. The second World War required more steel; therefore, more coke for blast furnaces and iron cupolas. During that period every phase of the coke producing industry was enlarged and forced to the limit. Beehive ovens were revived and in 1942 produced eight million tons out of a total of 70 million. Still another emergency supply of coke for the metallurgical field came from the merchant coke industry, which had developed the sale of approximately 10 million tons of coke per year for home heating. Coke was diverted from that field to the metallurgical or other war essential industries. Domestic coke dropped to 3½ million tons per year. Today another war emergency brings about a greater demand for steel than we have ever had. Recognition of these facts emphasizes the necessity for increased facilities and of equal importance the maintenance of all presently available plants.

Stability in War

The Bureau of Mines figures show that about 35 per cent of coke ovens in the United States are at least 25 years old. Another 15 per cent is 20 years old. There is no exact criterion on the life of coke ovens, but if we use an average expectancy of 20 years, these figures show that half of our coke ovens have outlived their expected life. Comparing the coke oven production condition in this country with that which prevailed in Germany during the last war, it should be noted that the production of coke in German plants far exceeded the requirements of the steel industry. The coke oven shortage suggests a comment on the stability of the coke oven in war, and here we find more cheerful information. In the last war the bombing of strategic industries became an operation of first importance. In another war with the improvement in air transportation, there will undoubtedly be a greater concentration on wiping out or at least curtailing essential production. Without in any way attempting to discuss the merits of strategic bombing, it is well known and quite evident that certain industries, which consist largely of tanks, pipes, and stills, are much more easily destroyed than steel plants or coke oven plants. A tank farm or any concentration of tanks containing combustible liquids makes a beautiful target. A steel plant on the contrary is inherently armored plated, and, while the buildings may be badly damaged, it is an exceedingly difficult problem to knock out a high percentage of steel production, provided raw materials are available. The coke oven plant is not armored plated, but coke ovens are designed primarily to withstand fire and heat. The ovens themselves are a massive concentration of brickwork, constantly under high temperatures. They are scarcely if at all affected by bombing, except by direct hits, and a battery of coke ovens affords a

relatively poor target. Even a direct hit might knock out ten or 15 ovens, but there is no reason why the balance of the ovens cannot continue in operation on a regular schedule. That is not only a possibility but it is known to have happened in Germany. There may be interruptions because of damage to coal or coke conveying systems or to tanks, condensers, etc., but these interruptions can cause only temporary delays and little production loss. Since almost the entire raw material used is coal, the coke oven finds itself in a relatively good position, because it is almost impossible to destroy a stock pile of coal. From the best information available, detailed survey of damages to coke oven plants in Germany in the last war confirm the above statements. Recognizing the fact that coke ovens produce irreplaceable materials necessary for conduct of the war, it is consoling to know that such plants are poor targets and that only bombing of the most concentrated continuous type can materially reduce production. The location of coke ovens in the United States follows, to a large extent, the steel plants, but these are widely spread with the principal concentration extending from Chicago to New York, a distance of over 800 miles.

Coke Ovens in Natural Gas Areas Are Important

The attention of the gas utility industry and the attention of those interested in the national economy concentrates at the moment on what is happening to the so-called merchant coke plant business, especially those plants where gas has been sold and used in the domestic field. Up-to-date we, in the United States, have had a minimum of controlled economy as compared to the remainder of the world. Free enterprise has been our slogan. Under that system a business rises or falls automatically through its ability to meet competition. In some parts of the country where natural gas is available in ample quantities, at low costs, certain coke plants have closed down completely. Others, where the distribution of straight natural gas has been put into effect, no longer are able to sell their gas production in the manufactured gas field. They either sell the gas for industrial purposes, burn it under boilers, or possibly waste it, but they still continue to operate. Illustrations are the plants in St. Paul, Waukegan, and St. Louis. Other coke oven plants where mixed gas is distributed continue to fill essential needs. Each location or situation has its own individual problem. The answers to some situations have been completed; to others it is still in the making. Unquestionably, in the light of conditions today, an unbiased review will show the companies owning coke plants or having available a supply of coke oven gas are in a fortunate and enviable position. Certain it is that, for the predictable future, all coke ovens will be operated at a maximum capacity.

ESTIMATE OF COKE SITUATION IN U.S. AS OF JAN. 1, 1951

Prepared by Samuel Weiss, executive secretary, American Coke and Coal Chemicals Institute.

		Net Tons
	Oven coke capacity 1/1/50 per U.S. Bureau of Mines	73,710,100*
(1)	Added capacity during 1950	3,724,000
(2)	TOTAL CAPACITY 1/1/51	76,984,100
	Available production at 94 per cent of capacity (allowance to outages due to repairs and condition of ovens)	72,365,054
	Available beehive coke per annum	5,500,000
	TOTAL AVAILABLE COKE	77,865,054
(3)	Blast furnace capacity 1/1/50 in net tons of pig iron and ferro-alloys per American Iron & Steel Institute (including allowance for relining, repairs, etc.)	71,497,540
	Furnace coke required for capacity pig iron and ferro-alloys production based on 1949 ratio of .9479 tons of coke per ton of metal produced per U.S. Bureau of Mines	67,772,518
	Requirements of foundry coke—actual 1948 production	3,191,900
	Requirements of miscellaneous industrial coke—actual 1948 production	2,261,400
(4)	Requirements of water gas coke—actual 1949 production	3,302,700
	Requirements of producer gas coke—actual 1949 production	790,900
	TOTAL REQUIREMENTS	77,319,418
	SURPLUS (exclusive of requirements of coke for domestic heating and export)	545,636

(1) Based on experience since 1944; net gain in oven coke capacity will not exceed 50 per cent of added capacity during 1950.
(2) Does not reflect probable loss in old capacity which will be reported 1/1/51.
(3) This tonnage will be a minimum requirement for production of projected 105,750,000 tons of steel by 1952.
(4) Probable requirement for calendar year 1951—2,000,000 tons due to increased availability of natural gas.

*Total coke making capacity (which capacity is exclusive of breeze) includes five per cent which is under one inch in size.

ESTIMATE OF BLAST FURNACE COKE SITUATION JAN. 1, 1951

	Net Tons
Oven coke capacity at integrated and non-integrated furnace plants 1/1/49 per U.S. Bureau of Mines	60,300,000
Available capacity 1/1/50	59,500,000
Added capacity during 1950	3,274,000
(1) TOTAL CAPACITY	62,774,900
Availability Coke at 94 per cent of capacity (allowance for outages due to repairs and condition of ovens)	59,008,406
Maximum blast furnace coke requirement per annum	67,772,518
Deficit furnace coke at furnace plants	8,764,112
Oven furnace coke supplied by merchant and utility coke plants—1950 estimate	2,900,000
Furnace coke supplied by beehive ovens—1950 estimate	5,500,000
TOTAL	8,400,000
Net deficit furnace coke at furnace plants	364,112

(1) Does not reflect probable loss in old capacity which will be reported 1/1/51; based on experience since 1944, net gain in oven coke capacity will not exceed 50 per cent of added capacity during 1950.

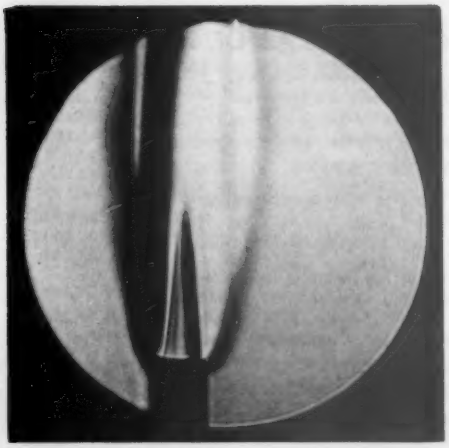
3 New AGA Research Bulletins Are Now Available

Three new research bulletins devoted to industrial and commercial research, general utilization research, and water heating research have been released by the American Gas Association Laboratories.

Research Bulletin 56, "A Study of Small Diameter Gas Glow Tubes," explores the technical aspects of the use of small size refractory tubes made of silicon carbide for use at temperatures above 2,000 degrees. The study is centered around design relationships and the performance of tubes of three inch diameter and less. Heat transfer equations were developed for tubes of one and three inches in diameter. This bulletin is available from the AGA Laboratories at $1.25 per copy.

Research Bulletin 57, a general utilization research publication, presents technical data on the design, construction, and performance of pilot burners. It is based on a study of those design factors related to air injection and flame characteristics. Bulletin No. 57 costs $1.00 per copy.

Research Bulletin 58 presents the results of a fundamental study of condensation in water heaters. The work analyzes the factors contributing to the formation of condensation and reviews the known methods in use for minimizing and reducing the undesirable effects of this phenomena. Bulletin No. 58 is $1.25 per copy.



Schlieren photographs revealing isothermal regions in gas flames are used in combustion studies

Institute of Gas Technology Gets New Building And Has Ninth Birthday

The new building

CONTRIBUTIONS of the Institute of Gas Technology to the gas industry and the nation's economy were outlined November 2 at the ninth annual meeting of the Institute's board of trustees.

Highlights of the meeting were the dedication of the Institute's new $900,000 building in an address by Frank C. Smith, President of Houston Natural Gas Co. and first chairman of the board, and the annual report of Director Elmore S. Pettyjohn.

In his review of the Institute's progress, Mr. Pettyjohn reported that:

The Institute completed and moved into its $900,000 laboratories on the Illinois Institute of Technology campus. Of the more than $500,000 required for the building, $472,708 has been paid or subscribed by 196 gas companies.

"Stress in equipment and research to date," Mr. Pettyjohn reported, "has been directed toward increased service by improving products through new or improved processes.

"The first problems were to accommodate the expansion in the post-war period and the seasonable demand. The former is being accomplished by the extension of transmission mains, and the latter has been and is being overcome by the conversion of oil to substitute natural gas.

"The immediate problem is the increase of service through improvement of distribution systems. A calculator to develop a method for computing pressure drops to locate restrictions and to limit replacement or extensions to a minimum is now being studied."

In his dedication address, Mr. Smith reviewed the history and accomplishments of the Institute in educating personnel in fundamental and applied research, in collection and dissemination of scientific information, and in achieving coordination of research within the industry.

"Seventy research projects have been completed by the Institute for member companies and related interests, and 31 projects have been undertaken for the American Gas Association. Of the latter, 21 have been completed and 10 are current," Mr. Smith stated. "Twenty basic projects have been sponsored by the Institute, nine of which are in progress.

"To date 76 men, selected graduates of accredited colleges and universities have received education at the Institute. Two doctor's degrees and 19 master's degrees have been awarded. The student body at present numbers 31.

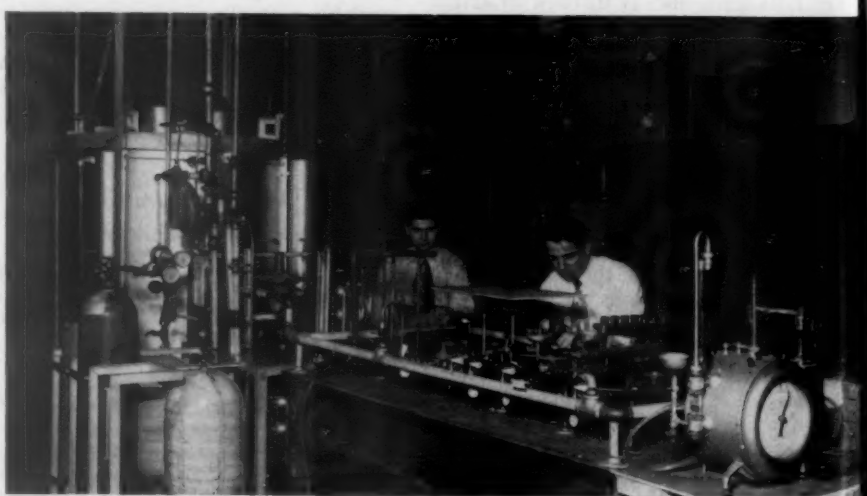
"The teaching faculty is comprised of 15 full-time and 15 part-time instructors. In addition, there are 22 technical and 19 administrative and non-technical personnel on the staff."

Officers re-elected were: Frank H. Lerch, Jr., President of Consolidated Natural Gas Co., chairman of the board of trustees, and Raymond J. Spaeth, secretary-treasurer. Dr. Henry T. Heald, President of Illinois Tech, serves as Institute President.

Trustees re-elected for an additional three-year term were: Frank H. Adams, President of Surface Combustion Co.; Walter C. Beckjord, President of the Cincinnati Gas and Electric Co.; Alexander M. Beebee, President of Rochester Gas and Electric Corp.; Thomas Drever, chairman of the board of American Steel Foundries; N. Henry Gellert, President of Seattle Gas Co.; John L. Holloway, President of Crane Co.; N. C. McGowan, President of United Gas Pipe Line Co.; Frank C. Smith; and Harry K. Wrench, President of Minneapolis Gas Co.

James S. Moulton, executive vice-president of Pacific Gas and Electric Co., was named to replace H. L. Farrar, President of Coast Counties Gas and Electric Co., whose resignation was accepted.

Two new members of the board's executive committee are: James D. Cunningham, President of Republic Flow Meters Co.; and James F. Oates, chairman of the board of The People's Gas Light and Coke Co.



Interchangeability of gas tested using manifold of "fringe burners."

Collecting Money Can Be Done Sensibly With Tact and Understanding

by C. L. Havener

Consolidated Edison Company of New York

HOW many of our customers at times feel like telling *us* to go to hell, when we approach them for money.

I am thinking specifically of a daily practice in our industry which I am sure not one of us likes. Yet it seems that we have all accepted it as an integral part of our daily operations, and I am inclined to think that we go about our business from day to day without really being mindful of what it does to the customer and of its full effect upon our company and the industry as a whole. It's a subject which collection men have talked about frequently in recent years, but there has been a division of opinion which has resulted thus far in no specific recommendation.

Here are a couple of letters typical of what is being sent out every day in the week by the public utility industry.

1. "We regret to inform you that our supply of service to you will be discontinued unless payment in full of the amount indicated as past due is received before the date shown above. Should service be discontinued it may not be possible for us to restore it for at least twenty-four hours after payment is received. We dislike to deprive a customer of service because of unpaid bills and hope that your prompt payment will make this action unnecessary. If payment has been made just prior to the receipt of this notice, please disregard it and accept our thanks."

2. "In order to maintain your present credit standing it is necessary for you to pay your gas bill amounting to $— without delay. It is always with reluctance that we discontinue service for non-payment of bills. It is inconvenient for you and embarrassing to us. Fairness to all customers demands a reasonable yet firm policy. Therefore, we regret to advise you that unless payment of this amount is made on or before — service will be discontinued. Of course, if you have already made full payment, please disregard this notice."

These are cut-off notices, these threats to deprive the customer of gas and the subsequent actual turn-off of service. Perhaps some word the notices differently. Maybe some say: "Dear Mr. Jones, Don't bother bringing home the roast beef for Sunday dinner, unless you pay this bill by next Thursday, because Mrs. Jones won't be able to cook for you and the kids."

Or perhaps, if writing to a house heating customer during the cold days of December, you say: "Better get out your red flannels, Mrs. Brown, if this bill is not paid by next Wednesday, because it's going to be pretty cold in your house." Or, if you are a dual service company, you might say, "Don't plan on looking at the fights on television Friday night or have company for dinner on Sunday unless you pay this bill by next Thursday, because you won't have any electricity or gas." Now, if you do not actually say that, you might as well because that is what you mean. Isn't it? We know that the customer can't get the service any place else.

The *Tough* Way Is the *Hard* Way

It is, of course, especially important how we word and construct our letters, but no matter how we say it, it is still the same thing—an ultimatum—Pay up or else! And if it isn't paid, we follow through and a certain percentage of customers are actually deprived of service. I know the customer owes us money and should pay it. Of course we are entitled to the money, but is this the most considerate way to go about getting it? Is it in the long run the most economical method?

Our industry sends out thousands, yes, hundreds of thousands of disconnection notices each year, and the majority go out to the same customers month in and month out. That is my experience and, I know, the experience of others of our Collection Committee. Does it really seem sensible to repeat the same old routine of sending a bill and then writing to the customer and saying the same old thing? How much effort do we really exert to arrive at an understanding with the customer about regular payment of his account to avoid these notices?

Here's what the New York Telephone Company Practice says about it:

"Action directed only toward collection of the amount of the bill owing at the time tends to result in the necessity for repeated collection efforts in subsequent months and, therefore, effort should be directed towards developing regular paying habits by giving customers an understanding *as to when and how bills are rendered and when payment is due."*

I have emphasized the word "understanding" because it is the key word to this entire subject. I know that a lot of you will think that I'm suggesting the impossible, that we can't change the customers' paying habits. The telephone company apparently thinks we *can* change customers' paying habits, and I know from my own experience that we can.

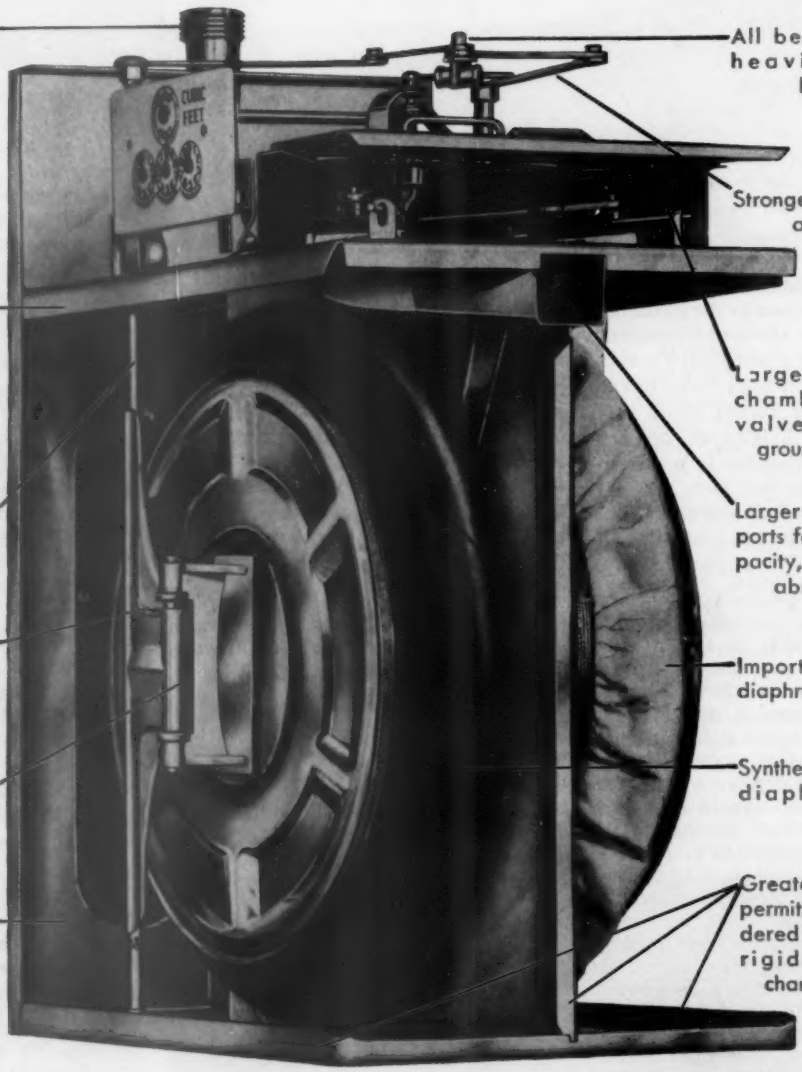
I contend that when we encounter difficulties with the customer regarding payment of his account, we shouldn't just let him go. We should attempt to arrive at a definite understanding with him, not only about payment of the current bill but about payment of future bills, and bring him back to the good-pay group. We know that unless he moves we shall continue to render bills regularly to him. So why not try to settle it once and for all—first in the interest of having the customer's good will and, secondly, from an ultimate cost viewpoint. You know, we collection fellows (opinions to the contrary notwithstanding) are not only interested in getting in the money; we are also most desirous of maintaining the customer's good will, and in accomplishing this with as little cost to the company as possible.

It will, of course, be more of an expense at the outset to call on these customers, but from tests made it appears that a majority of the customers who are now receiving disconnection notices regularly will respond favorably and pay their future bills without any collection action. We know that there will be a certain percentage of the customers, despite

(Continued on page 44)

Presented at annual meeting of the American Gas Ass'n, Atlantic City, Oct. 2-5, 1950.

Rockwell-Emco



Wide flanged tube screws for greater strength. Rolled steel threads

Chrome plated crank for better wearing quality

Heavier flanges on table give a wider soldered joint, greater rigidity, less chance for inside leaks

Large diameter flag wire

Ribbed flag for greater strength

Bronze bushed rocker shaft carrier

Wider case permits full diaphragm movement without contact-tacting metal

All bearing areas heavily bronze bushed

Stronger, thicker flag arm links

Large area valve chamber permits valves to be re-ground with ease

Larger channels and ports for greater capacity, less pressure absorption

Imported sheepskin diaphragm (optional)

Synthetic rubberized diaphragm (optional)

Greater flange area permits a wider soldered joint with more rigidity and less chance for leaks

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SUPERIOR GAS MEASURING INSTRUMENTS . . . . . MADE FO

modern tin meters

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5 LT. METERS

The ever-popular size for most requirements. Made in three capacity ranges as follows:

Model 5-150
Capacity 150 cfh

Model 5-200
Capacity 200 cfh

Model 5-250
Capacity 250 cfh

10 LT. METERS

Use with profit on house heating installations; larger-than-average domestic loads or for service growth anticipation. Made in three capacity ranges as follows:

Model 10-300
Capacity 300 cfh

Model 10-425
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Rockwell-Emco Tinned Case meters are machined, assembled and proved under ideal manufacturing conditions. Large volume, standardized production permits the use of every adjunct that will assure higher precision and better value for buyers. Too, the Rockwell organization has pioneered many improvements in tin meters that are reflected in better performance, greater capacity and longer life. The more notable features are highlighted on the opposite page. *Write for bulletin 1020.*

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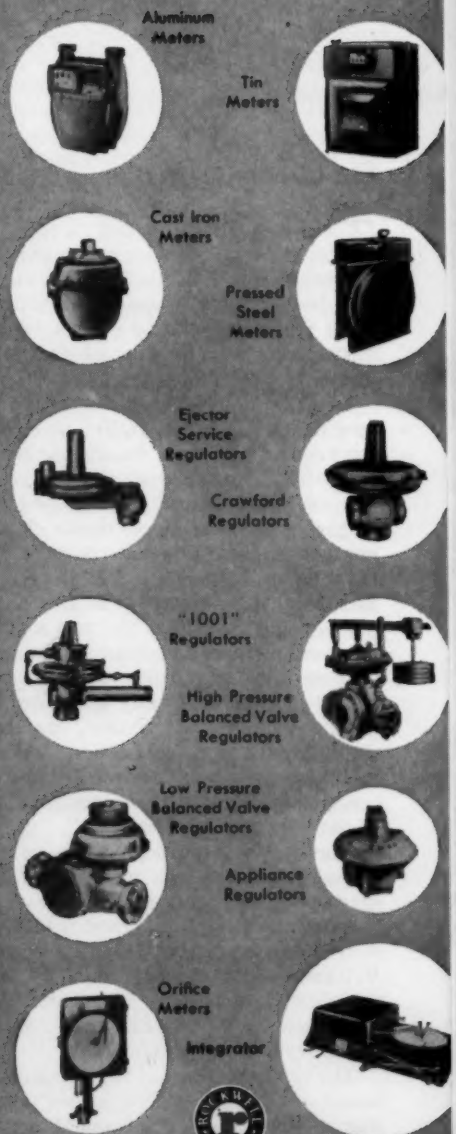
a size and type meter and regulator for every requirement



Pittsburgh Equitable Meter Division
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Illustrations of Galvanic Corrosion Given in Tabloid Primer

by A. B. Lauderbaugh

Chief Gas Engineer, The Manufacturers Light and Heat Co., Pittsburgh

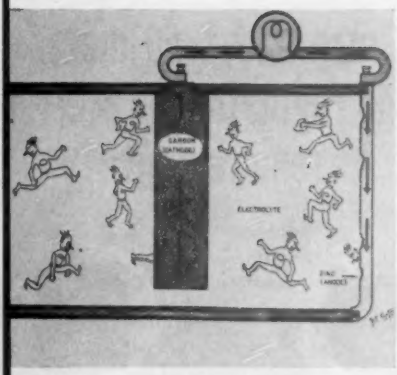


Fig. 1—Galvanic cell (battery).

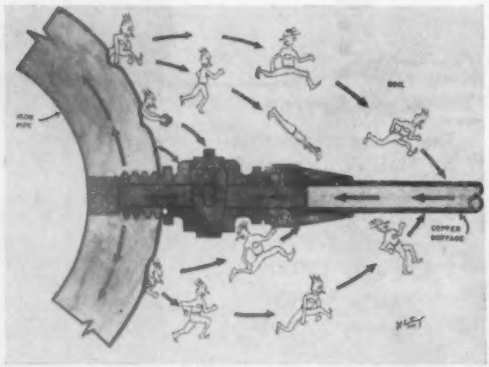


Fig. 2—Galvanic cell (dissimilar metal).

THE principle of the electric cell constructed of dissimilar metals in a salt solution is older than the gas industry. In 1792, an Italian physiologist, Luigi Galvani, reported on his experiments with metallic arcs of dissimilar metals in an electric circuit.

In 1786, Galvani was conducting an investigation in comparative anatomy, working primarily on the muscle structure of the frog. During the course of this work, he noticed that hanging the frogs over an iron rack, by means of copper hooks, seemed to cause twitching of the muscles of their legs. He discovered that this twitching was due to an electric phenomenon, and that the two metals, iron and copper, had some direct connection with the reaction. Galvani presumed that this electricity was a combination of internal forces operating through the copper connection, and external forces operating through the iron connection. He called the combination of the two "animal electricity."

One of the famous physicists of the period, Volta, already well known for his many experiments and discoveries regarding electricity, disagreed with Galvani about the origin of this electricity. Volta was able to demonstrate that it was the dissimilarity of the metals touching the muscles of the frog that produced the electricity and the twitching.

The phenomenon has been named in honor of Galvani, the first person to notice it, but from Volta came the first practical explanation of the variables effecting the origin and magnitude of these electric currents.

Here are illustrations from common everyday applications in the gas industry of the principle of the electric cell discovered by Luigi Galvani, and developed and explained by Volta. This review is intended to be a primer of corrosion. It will explain the why and wherefore of the end results of corrosion.

This primer consists of a series of illustrations developed by the corrosion department of The Manufacturers Light and Heat Co. For more than two years, they have been used throughout properties of the Pittsburgh Group of the Columbia Gas System as part of an employee education plan.

The principle of the electric cell discovered by Galvani is best illustrated by the operation of an ordinary flash light battery. (Fig. 1) The electricity lighting the filament of a flash light is the result of suspending dissimilar metals, zinc and carbon, in an electrolyte, and connecting them externally by means of a wire. In producing the electric current, the outer battery case, zinc, corrodes. After continued use, the battery fails because the zinc case is finally ruptured by pit hole corrosion from the inside.

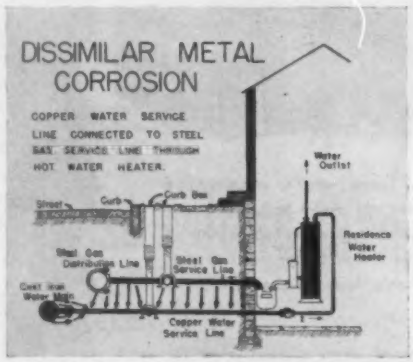


Fig. 3.

These pit holes on the inside surface of the zinc battery case are the result of current flowing from zinc, the anode, through the electrolyte onto the carbon cathode, returning to the zinc by traveling over the wire and through the filament. Where current leaves a metal surface, the anode area, the metal will be corroded. Where it flows onto the surface, the cathode area, a thin film of hydrogen will be deposited.

This film of hydrogen, if it remains on the surface of the cathode (in this case, the carbon rod in the center of the battery), acts as an insulator and tends to retard the flow of the galvanic current.

With the cell in operation, the flowing particle of metal called a metal ion, in this case, zinc, leaves the battery case and goes into solution in the electrolyte. It is exchanged at once for a hydrogen ion, leaving the metal behind as a tubercle around the pit area.

Since Galvani's original cell, like this flash light battery, was produced by using dissimilar metals, consider some of these dissimilarities in a gas system, and identify the corresponding parts of this cell when it is found along a pipe line. (Fig. 2)

Some gas companies may now be using copper service lines between the distribution piping in the street and the customer's meter inside the house. They are creating a dissimilar metal galvanic cell analogous to the flash light battery. In this case, the dissimilar metals will be the iron pipe of the distribution main and the copper tubing and brass fittings connected to the main, and extending into the house. Current flow will be from the iron or steel pipe (the anode) into the soil (the electrolyte) and onto the copper tubing and brass fittings (the cathode).

The metal wall of the tubing and stop take the place of the wire, and the current returns to the anode area over this

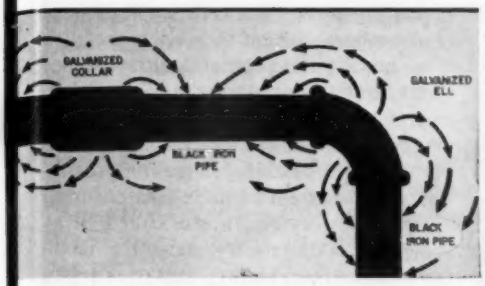


Fig. 4—Dissimilar metal (fittings).

Fig. 5—Dissimilar metal cinders.

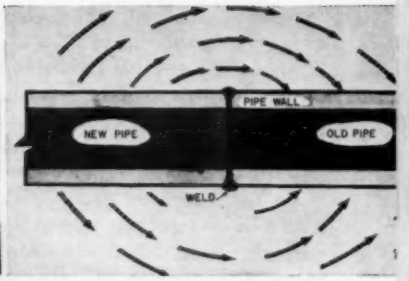


Fig. 6—Dissimilar surface.

metallic path. It is always where current leaves the metal, the anode area, that corrosion takes place. In this case, the flowing particle of iron, the iron ion, leaves the pipe wall and goes into solution in the soil water, where it is exchanged for a hydrogen ion. The hydrogen then deposits as a molecular like film on the surface of the copper service line, protecting it from corrosion, by the very act of corroding the steel distribution main in the street. The use of an insulating coupling at the point of attachment with the steel main will break the electrical circuit and stop the activity of this cell.

If a water company is now installing copper service lines, steel gas service lines will develop leaks as a result of their being the anode of a dissimilar metal galvanic cell (Fig. 3). The two service lines are probably only a short distance apart all the way from the street to the house, where they are mechanically connected at the water heater, completing the external electrical circuit of the cell. In this cell, iron will always be the anode, and current will flow from the steel service line through the soil to the copper water service, returning through the water heater to the gas service line. As it leaves the steel gas line, it carries away metal ions of iron (20 pounds per ampere per year). These iron ions are exchanged for hydrogen ions, which are then deposited on the surface of the copper water line, protecting it from corrosion at the expense of the steel gas line. Installation of an insulating coupling at the gas meter will break the external electric circuit and stop the action of this galvanic cell.

The use of galvanized fittings with black iron pipe (Fig. 4) will produce dissimilar metal cells that can be very damaging to the galvanized fitting. The galvanized coupling or ell will always be the anode of this galvanic cell, and, it's the anode that corrodes. The rate of corrosion in this case may be accelerated by reason of the fact that the surface area of the anode is much less than that of the cathode (the pipe). All of the current requirements for the relatively large area cathode must come from the small surface area of the fitting, resulting in rapid pitting of the coupling, ell or tee. The obvious solution is to use fittings made of material as nearly as possible like that in the pipe.

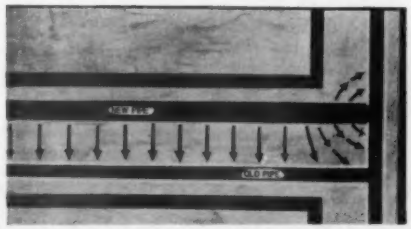


Fig. 7—Dissimilar surface.

The immediate and rapid corrosion of steel pipe in contact with cinders (Fig. 5) is another example of the action of a dissimilar metal galvanic cell. In this cell, iron will be the anode, and the carbon cinder, the cathode. The acids leached out of the cinder contaminate the soil around the pipe and increase the activity of the cell. No hydrogen film collects on the cinder cathode. The cell remains active, just as the modern flash light battery continues its high rate of activity. The result is rapid corrosion of the pipe metal.

One of the most common, but least considered, galvanic cells is that produced by welding a piece of new pipe in an old line (Fig. 6). It is not the metal in the pipe wall, but rather the surface metals, rusty pipe and new pipe, that provide the dissimilarity of metal producing this galvanic cell. The new steel pipe will always be the anode of the galvanic cell created by mechanically connecting the old and new pipe.

Other things being equal, the smaller the section of new pipe installed, the more rapid the corrosion may be, because, again, all the current for a large cathode area must come from a relatively small anode area. If the new section of pipe is installed because the original pipe was damaged by corrosion, then the corrosive action of this new galvanic cell may be added to the original corrosive effects, and the life of the new pipe may be less than that of the original section.

The same sort of dissimilar surface galvanic cell is created by installing a new line alongside an old line (Fig. 7), and connecting the two lines with cross-over lines or headers. Current will flow from the new line, through the soil, onto the old line, returning to the new line by way of the cross-over or header. The old line will receive at least partial protection from further corrosion, but at the expense of damage to the new line. Unfortunate experiences with new parallel lines have caused some gas company operating men to mistakenly credit "the good old days" with making better pipe than that now being manufactured.

A dissimilarity of metals can occur between an imbedded piece of black oxide and the rest of the surface of a piece of new pipe. Or, the dissimilarity may be between the possibly different metallic surfaces of such things as the followers, bolts and center rings of a coupling (Fig. 8). Some of these parts are cold pressed, others are formed hot, so there are several different types of surface to form galvanic cells (Fig. 9). In each case, it is the anode, the surface from which the current is passing into the ground, which will corrode. If the anode area is small with respect to the cathode area, the corrosion may be severe.

Almost the ultimate in unfavorable ratio of anode and cathode areas is typified by still another of these dissimilar surface galvanic cells (Fig. 10). In this cell, the bright metallic surface of the shallow threads adjacent to a fitting, or the bright scratches made by the jaws of

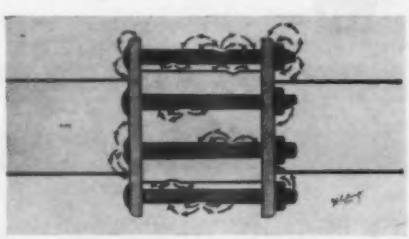


Fig. 8—Dresser coupling.

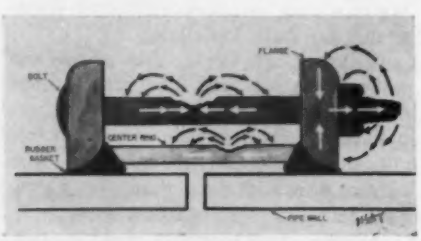


Fig. 9—Dresser coupling.

a pipe wrench, will be the anode. Because the relative area of such anodes is small, they are often extremely active. A service line corroding through right alongside a fitting, almost as though it had been cut with a knife, testifies to the severity of this cell action.

So far, only the galvanic cells produced by dissimilarity of metal or metal surfaces have been considered. The physicist, Volta, demonstrated that many other dissimilarities, among them dissimilarity of electrolyte, would result in a flow of electricity. This difference in electrolyte (Fig. 11) we find in our business as dissimilarity of soils.

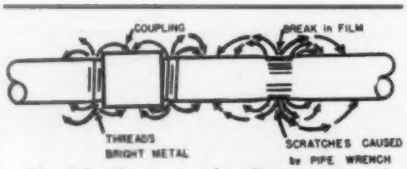


Fig. 10—Corrosion by dissimilarity of surface conditions.

ential aeration of the soil around a pipe. (Fig. 13). In this case, the soil throughout the depth of the ditch is uniform as to type or kind, but the pipe rests on heavy, moist, undisturbed ground at the bottom of the ditch, while the rest of the circumference is in contact with the

"positive areas," that is to say, those sections where current is leaving the pipe line to take the path of least resistance back to the generator in the sub-station, are the areas in which severe corrosion takes place. The electrolysis departments of gas utilities developed methods for reducing the extent of these positive areas by properly draining this so-called "stray current," taking them through the necessary resistors and relays, and over a wire from the pipe line to the generator in the sub-station. Men ordinarily did not pay very much attention to the large negative areas, i.e., the areas in which current was flowing onto our pipe lines.

Fig. 11—Dissimilar soil.

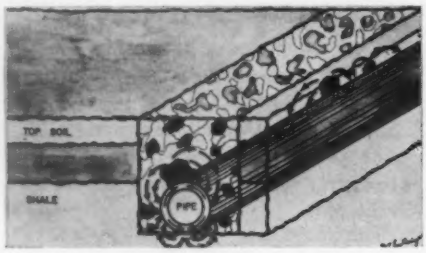


Fig. 12—Dissimilar soil (back fill).

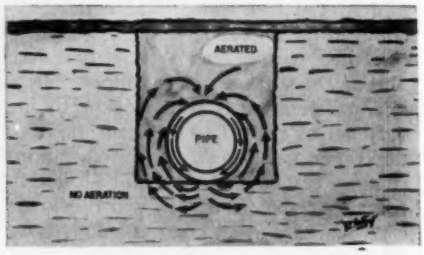


Fig. 13—Differential aeration.

One section of the pipe line may be laid through sandy loam, while a short distance away, the pipe is buried in a clay type soil. That portion of the pipe in contact with clay will form the anode of a galvanic cell, and will corrode. If the resistance to current flow through the soil from the anode to the cathode is high, the rate of corrosion may be slow. Conversely, if this resistance to current flow is low, the rate of corrosion may be rapid.

Galvanic cells caused by dissimilarity of soil (Fig. 12) may also be the result of mixing the dirt from the spoil bank formed when the ditch was dug. Large clods of dirt originally from various depths in the ditch, may rest directly against the pipe after the dirt is backfilled. Such a condition is particularly apt to occur when the ditch is dug by hand. Where clods of clay touch the pipe, the tendency is for that area to become the corroding anode of a galvanic cell. Machine ditching usually results in a thoroughly mixed spoil bank, producing a great number of small cells having a tendency to neutralize each other, resulting in a slow corrosion rate attributable to this particular cell action.

Galvanic cells having their anode and cathode areas around the circumference of the pipe are often spoken of as "short path cells," since the path of the galvanic currents is short. There may be more current flow with these than with a long path cell, and rapid pitting can result.

Another short path cell of the dissimilar electrolyte type is the result of differ-

drier, loose backfill. The small area anode, two or three inches wide, on the bottom of the pipe, is supplying all of the cathode current requirements for the rest of the pipe circumference. Rapid and severe pitting is the usual result.

Gas companies have long recognized that in certain areas near the sub-stations of electric street railways, they could expect to have trouble with corrosion. In fact, many gas company corrosion departments were started 20 or more years ago as electrolysis departments. Their purpose was to devise the proper precautions to be taken to prevent severe corrosion at certain areas along street railway systems. (Fig. 14).

Most street railways operate with a single wire trolley, using the rails as the current return path to the electric generator. The network of pipe lines in the vicinity of the street railway acts as an additional return system by which current leaking off of the rails may return to the sub-station. The "hot spots," or

Within the past ten years many of these electric street railway systems have been abandoned. Since their abandonment, we have suddenly developed a multitude of leaks in areas that had never before shown any signs of corrosion. (Fig. 15). What has happened is that the literally many thousands of galvanic cells of all types along the lines in these negative areas were kept inoperative by the flow of current onto the pipe line. As soon as the street railway stopped operating, these latent galvanic cells started operating. Within a few months or years, the lines have developed leaks, the length of time required depending upon the activity of the cells in these new areas of corrosion.

If the "stray current" flowing onto a pipe line from the tracks of an electric street railway could keep all of these galvanic cells from operating, then it should be possible to produce the same result by the use of a controlled current flowing onto the pipe line. (Fig. 16). A

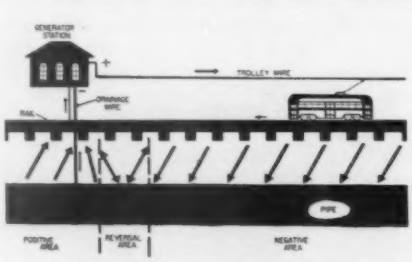


Fig. 14—Cathodic protection from street railway system.

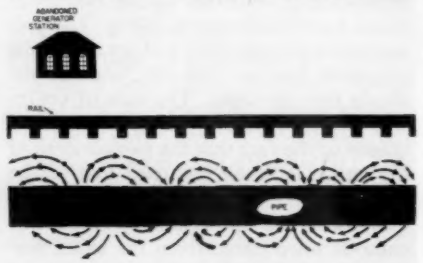


Fig. 15—Latent Galvanic cells.

company can buy alternating current at various places along the pipe system and convert it to direct current by means of a rectifier. One side of the rectifier is then connected to a ground bed, which takes the place of the rails of a trolley system. The other side is connected to the pipe line system which it is desired to protect. Current will flow from the ground bed (the anode), through the soil and onto the pipe line to be protected (the cathode), and will be drained off this line by the wire connecting the pipe to the rectifier, just as drainage wires were attached in the positive area at the substation to lead the current back to the convertor. It is called cathodic protection, because the line being protected is the cathode of an electric cell.

This method of protection is simple and direct. It is also susceptible to complications because of what is called "cathodic interference," if there is a high pressure line going through that portion of a distribution system which it is desired to protect by means of "impressed current." This high pressure line may also pick up current from the ground bed and carry it along to some place where the high pressure line crosses over or goes near the distribution line. Then, because the current has to get back to the power source, it will jump from the high pressure line and go through the ground to the distribution line. This short section of the high pressure line then becomes an anode. Every ampere of current leaving the high pressure line in this area is going to carry pipe wall metal with it, twenty pounds per ampere per year.

You Have to Know How

It sometimes requires a very elaborate wiring system to effectively equalize the various underground structures which may be exposed to "stray currents" by the use of cathodic protection units. In practice, the use of "impressed current" to protect a network of lines becomes so complicated that its application should only be undertaken by the experienced electrolysis and corrosion engineer.

A copper water service line can be protected by reason of its being the cathode of a dissimilar metal galvanic cell. It follows quite logically then that if we could make all of the area along a pipe line the cathode of a strong galvanic cell, by supplying an expendable dissimilar metal as the anode, it would be possible to suppress the natural anode areas along the pipe line, and thus keep these natural galvanic cells from damaging the pipe.

There are three readily available metals, aluminum, zinc, and magnesium, each of which will form a strong galvanic cell when combined with iron. (Fig. 17) Any one of the three can be used to construct this galvanic cell. Mag-

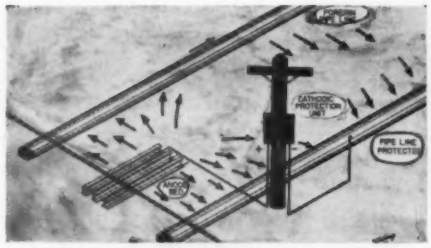


Fig. 16—Cathodic protection.

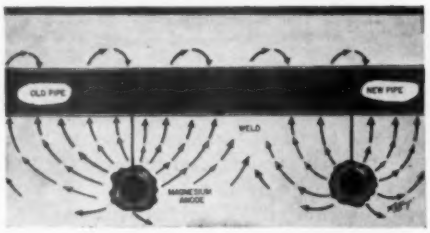


Fig. 18—Galvanic protection.

nesium forms the strongest of the three, and is therefore most used.

This galvanic cell is similar to the flash light battery mentioned before. The magnesium ingot is the expendable anode, the outer case of the battery; the soil is the electrolyte; the pipe surface is the center cathode of the battery; and the insulated wire, with one end soldered to the pipe, and the other to the magnesium, completes the electrical circuit. Current will flow from the magnesium to the ground, taking metal ions of magnesium with it. It then flows through the ground onto the pipe, counteracting the undesirable natural galvanic cells that may be present. The ingots of magnesium used to create these galvanic cells may be any one of a number of different sizes and weights, ranging from four pounds through 32 pounds.

They are usually installed by digging a hole deep enough to put the ingot about on a level with the pipe line, filling in around the magnesium with some sort of special "backfill." The purpose of the "backfill" is to provide better electrical efficiency for the anode. Field tests have demonstrated that ordinary builder's plaster, mixed with sand, makes a satisfactory backfill.

An insulated copper wire is used to connect the iron core of the magnesium anode to the surface of the pipe. This wire is usually brazed to the pipe by using a Thermite welding cup. The Thermite joint must then be covered with an insulating material, such as plastic pipe coating, to keep it from creating an additional and undesirable dissimilar metal galvanic cell. The size of the anode, its distance from the pipe line, and the distance along the line between anodes, are all functions of the use to be made of the anode.

The magnesium anode will corrode in providing this protection, and enough must be installed to last for the period

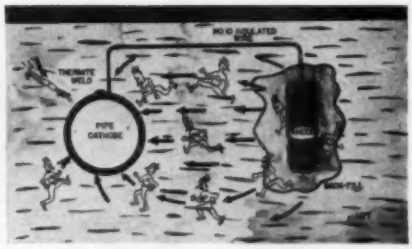


Fig. 17—Galvanic protection (magnesium anode).

over which it is proposed to protect the pipe line.

Most installations of magnesium are designed so that the anodes will provide a small amount of current flowing onto each square foot of the pipe line, and have sufficient mass of magnesium to last at least twenty-five years.

When magnesium anodes are installed in connection with the regular maintenance and repair program of a pipe line, there is no necessity for special tests. (Fig. 18). Any time it becomes necessary to replace a short piece of line, two or three five-pound anodes, or say one anode for each twenty-foot joint, can be installed at the same time in the same ditch with the pipe. Once the field crews have been shown how to make the installation, they can continue by themselves. There is no need for a corrosion engineer to be on hand for each individual job.

Life Extension?

The use of expendable anode galvanic cells for the protection of transmission or distribution piping is also quite simple. (Fig. 19). When protecting distribution networks, it is customary to sectionalize the piping by installing insulating couplings every two hundred yards or so along the street lines, and keep the gas piping electrically isolated from the water piping by installing insulating couplings at the gas meters. The anode installation pattern selected by the corrosion engineer will depend upon a number of factors, such as the size of the pipe line; the type, number and activity of the galvanic cells existing along the line; whether or not the soil offers much resistance to the flow of electricity; and, of course, how many years of life it is desired to add to the normal life of unprotected line.

It has been mentioned several times that the extent of corrosion of any type depends upon the magnitude of the electric current flowing from the pipe into the ground. It is obvious, therefore, that installing some type of electric insulating material as a barrier between the pipe surface and the ground will stop the flow of these curents, and prevent corrosion.

Many different types and kinds of coating materials, such as asphalts, coal tars, plastics, masticks, and greases, are

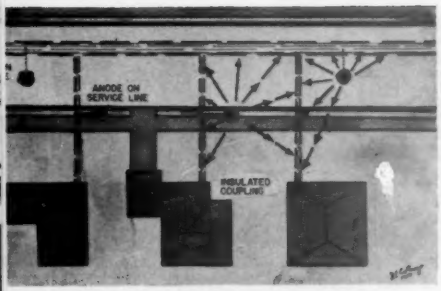


Fig. 19—Galvanic protection (distribution system).

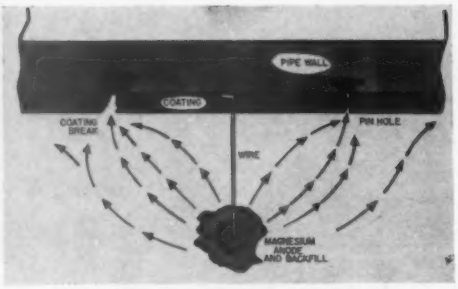


Fig. 20—Galvanic protection.

offered for use as this electrical barrier. If coating the pipe was the method of protection selected (Fig. 20), then expendable anodes can be extremely valuable to prevent corrosion of the coated pipe at small defects or "holidays" in the coating.

Any galvanic current flowing on a coated pipe line will be concentrated at these places where there is no barrier to the flow of current from the pipe to ground, with the result that extreme and rapid pitting may occur. By installing a magnesium anode and connecting it to the coated pipe, it is possible to prevent the flow of current from pipe to soil at these "holidays" and instead, force current to flow from the magnesium anode to ground, through the hole in the coating, and onto the pipe line, returning to the magnesium anode over the insulated wire.

Knowledge of galvanic currents has been greatly expanded since the days of Galvani and Volta. It is known that many dissimilarities will produce these currents. In the gas business, these damaging currents are produced by such things as the dissimilarity of metal between steel street mains and copper services, by the dissimilar surface condition or finish of black iron pipe and the tong or wrench scratches on the pipe, or the surfaces of new pipe and rusty pipe; by the dissimilarity of soil between top soil, loam, clay and shale; by the dissimilar aeration of otherwise uniform soil, that is, loose backfill and the undisturbed soil on the bottom of the ditch, to name a few of the more important dissimilarities.

Some of these cells could be avoided by proper design and construction. Others are unavoidable, or have already been built in, but can be counteracted by one of three treatments, such as using pipe coatings having electrical insulating value; by using impressed currents (cathodic protection); or by installing expendable anodes (galvanic protection).

If gas engineers ignore these galvanic currents, they will continue to destroy vital underground highways for the transportation of gas. If they follow the advice of corrosion engineers, galvanic currents can be put to work for the benefit of the company and the public.

Western United, Illinois Northern to Be Merged Into Public Service of Northern Illinois

Western United Gas and Electric Co. and Illinois Northern Utilities Co. will be merged into Public Service Company of Northern Illinois, Charles Y. Freeman, chairman of the latter company, has announced. Public Service Company securities will be issued in exchange for the outstanding securities of the Western United and Illinois Northern companies. There will be no public financing involved.

"It is imperative," Mr. Freeman said, "that the electric power generating stations and natural gas supplies of the three companies be integrated to meet the tremendously increased demands for electricity and natural gas.

"The territory of these companies is contiguous and extends from Lake Michigan to the Mississippi River and from the Illinois River to the Wisconsin state line. This area has had a large growth in population, bringing with it demands for more and more electric power and natural gas. According to the 1950 census, the ten-year increase in population in this area amounted to 381,000 people; and, along with the increase in population, innumerable small and large industries, factories and plants of every description were also established in this area. Electric stations and natural gas supplies must keep in advance of increasing population and industrial development.

"From 1940 to 1950, the electric load of the three companies increased 134 per cent, and the gas used increased over 200 per cent. The strategic location of electric stations must be determined and the natural gas supplies must be developed, in accordance with the distribution of increased population and the rapidly increasing number of industries.

"As the system of each company has developed and grown, it has become increasingly evident from engineering studies that the most efficient and economical production and use of power and natural gas can be attained by interconnecting and strategically locating the sources of power and supplies of natural gas. This plan will, through simplification, provide a more efficient means of furnishing adequate service to the area.

"Britton I. Budd, President of Public Service Company, will direct the management and operation of the enlarged organization. Murray D. Smith and George Fluehr, who have been directing Western United and Illinois Northern, respectively, will continue to direct their organizations as operating divisions of Public Service Company from their present headquarters in Aurora and Dixon.

"From the standpoint of the people of the entire area, the integration of these three companies will be a distinct improvement in meeting future needs and will not disturb the individual status of the officers and employes of each company, or its close relationship with customers and communities."

FPC Issues Accounting Manual For Natural Gas Companies

The Federal Power Commission has announced the availability of its uniform system of accounts for natural gas companies, incorporating amendments adopted by the commission August 22, 1950, effective January 1, 1951.

Copies of the accounting manual, FPC-A-12, priced at 40 cents each, may be obtained from the Publications Section, Federal Power Commission, Washington 25.

United Engineers Is Serving Niagara Mohawk's Program

United Engineers & Constructors Inc. of Philadelphia, is providing services and doing construction work for the Niagara Mohawk Power Corporation's current pipe line and gas main construction program.

Field inspection and supervisory services have been provided for the corporation for approximately 16 miles of 14" and one-half mile of 10¾" piping between Therm City and Dewitt near Syracuse and approximately 19 miles of 10¾" piping between Liverpool and Fulton, also near Syracuse. These lines are designed for use of natural gas at 300 psi and were constructed by Williams-Austin Co. of Pittsburgh.

In and around the city of Syracuse a part of the distribution main extensions necessary for this winter's heating load are being constructed by United Engineers.

Work is now progressing on a crossing of the Mohawk River, to complete the installation of approximately 22.6 miles of 10" and 12" piping from the corporation's Seneca street gas plant in Schenectady to a point in the city of Saratoga Springs and 2.6 miles of 10" and 12" at Albany. These gas transmission lines are being constructed by Harford Brothers of Emporium, Pa., and United Engineers is supplementing the corporation's provisions for inspecting these installations.

Humidifying and Oil Fogging Experience Related by NY & Richmond

by Bernard F. Rogan and Joseph V. Turpish

New York and Richmond Gas Co., Staten Island

THE first point at which we humidified was at the inlet of the transmission line located at Mariners Harbor, our district holder. This produced a 55-100 per cent relative humidity throughout the transmission line. The transmission line feeds Mariners Harbor holder, our two district regulators located 2.1 and 3.0 miles away and the plant holder located 6.0 miles away. We also were humidifying again at the two district regulator outlets and the two holder outlets.

We were much surprised at the far greater number of complaints in those districts fed by district and temporary regulators than in those districts fed from our two wet seal storage holders and the rapidity with which the number of complaints per day changed as the source of gas feed (holder, regulator or holder by-pass) was changed. To show how definite this could be, our records are given in the table to show the number of complaints at a time when we had about 15,000 customers converted to natural gas on the low pressure system. The number of complaints listed per day is the total number received from all causes.

To what extent the large number of dust complaints were due to improper humidifying at the regulator outlets at that time we do not know.

To determine the humidifying effect of the two wet storage holders on our natural gas, we shut off *all* humidification at the inlet of our transmission line and the outlets of the two holders and left it off for 48 hours. We then tested the relative humidity at the inlet and outlet of each holder. We found the inlets to be about 12 per cent and the outlet of one to be 90 per cent and the outlet of the other to be 70 per cent. These tests were repeated in the winter when the holders were heated and on days when the holders were not heated and during the summer and intervening times, and we found that the relative humidity of the holder outlet gas never varied more than five per cent from the two figures given. The holder having the 90 per cent relative humidity which is located at our plant is a four lift 1,000,000 cu. ft. storage with an average send-out of 1,500,000 cu. ft. a day. It has a pit diameter of 110 feet. The other is a three lift 1,000,000 cu. ft. holder with an average send-out of 750,000 cu. ft. It has a pit diameter of 130 feet. In trying to figure out why the holder with the small diameter and the least surface contact produced the higher relative humidity we were unable to arrive at a conclusion. We blew the holders to make sure there was no oil on the surface; the holders are kept between 90 per cent and 100 per cent of capacity, and there is no other explanation apparent.

Date	Day of Week	Number of Complaints	Note
Sept. 18	Sunday	14	(A)
19	Monday	251	
20	Tuesday	252	
21	Wednesday	258	(B)
22	Thursday	236	
23	Friday	238	
24	Saturday	206	(C)
25	Sunday	143	
26	Monday	647	
27	Tuesday	579	(D)
28	Wednesday	368	(E)
29	Thursday	297	(F)

NOTE (A): While the gas was fed from the district wet holder and the two district regulators, the holder outlet pressure was set so high that it supplied most of the gas to the customers.

NOTE (B): The humidifying equipment at the two district regulator outlets was completed and placed in operation. In order to do this and observe their operation, the holder outlet pressure was cut to normal and the two regulators supplied their usual areas.

NOTE (C): The Saturday and Sunday complaints were unusually high for a week-end. Extra servicemen had to be called in.

NOTE (D): On Tuesday afternoon we realized our mistake. The holder outlet pressure was rapidly increased and the regulator district pressures cut. Within three hours there was a noticeable drop in service calls.

NOTE (E): Many of the calls on the 28th were repeats on ones that could not be handled as received.

NOTE (F): From September 29 on, the complaints were almost back to normal, but some dust complaints continued in those areas fed by temporary regulators, or especially, when we fed gas through the Clifton holder by-pass for five weeks.

Everyone recognizes the fact that the humidity of a gas leaving a wet seal holder is in the form of a true vapor and will carry with the gas. Also since the average temperature of the gas leaving the holder is warmer than the ground, the gas in the mains will generally be 100 per cent relative humidity. From our psychrometric chart we can see that a gas of 70° F and 90 per cent relative humidity that cools only two degrees will be 100 per cent humidified.

We then turned on the humidification at the inlet of the transmission line thereby increasing the relative humidity at that point from 12 per cent to 55-65 per cent. The result of this was that the humidity at the outlet of Mariners Harbor rose to 88 per cent and at the plant to 95 per cent. Therefore we felt there was no need for humidification at the outlets of the two holders.

Perhaps some of the reported failures of humidification are due to the method of steam admission where steam is used. The President of an eastern company, that has been serving natural gas for ten years, most likely expressed it correctly when he said:

"After several years of operation with natural gas we found that the leakage on our low pressure systems was increasing and upon investigation discovered that whereas we had a relative humidity of 95 per cent at the point where natural gas entered the distribution systems, a mile away the relative humidity had dropped to around 50 per cent. This despite the fact that during the summer months the ground temperature was substantially less than the temperature of the gas at 95 per cent relative humidity entering the distribution system. We came to the conclusion that a considerable part of the moisture in the gas as it entered the distribution systems was carrying in mechanical suspension and was not in the form of true water vapor. This

Presented at meeting of Operating Section, New England Gas Ass'n, Providence, Oct., 1950.

mechanically suspended water dropped out very soon after entering the system leaving a comparatively dry gas on the rest of the system. This conclusion was borne out by the fact that the drips near the point where gas entered the system collected a great deal of water whereas those at a greater distance did not."

Oil Fogging

We have three hot foggers that oil the gas at three points: (a) where the gas enters our transmission system at 10 lbs. pressure and (b) at the outlet of our district wet holder and (c) at the outlet of the plant storage holder. There has been considerable discussion on rate of travel, distance of travel, etc. Ten days after the hot fogger was started at the entrance of the transmission system, we found oil showing on the threads of the plant dust catcher six miles away. Testing the trapped oil we found it to be the fogging oil with some light ends. As to distance travel, we find that oil drops out rather well at all points. It carries through the regulators in the intermediate and low pressure systems; and, in fact, a limitation on the amount of oil that can be fogged is caused by oil stoppage of appliance pilot filters.

On account of the good results obtained, we have tried only one oil. This has the following characteristics: distillation range 662° F-816° F, 43 per cent paraffines and 49 per cent naphthenes, and a viscosity S.S.U. of 105-110 at 100° F.

At the time of installation there were no automatic hot foggers on the market, so we installed two cold foggers at the outlets of two unattended regulator stations. We thought that we were getting good results and did not test for efficiency until recently. Then we found that 47 per cent of the cold oil fogged into the gas dropped out at the first drip pot 100 feet away. The good results were due to the hot oil fog carrying through the regulators. Other oils are now being tried in the cold foggers.

We cannot state that fogging is protecting our meters; but we can state that, according to meter shop records, we are experiencing absolutely no bleaching of meter diaphragms. There is no oily saturation of the leather, but there is an oily look and feel. Before we got the oil foggers functioning there was evidence of bleaching started. All incoming meters are proofed and they show no change since conversion except the old converted three light meters (average age—40 years) that had always given trouble.

Our distribution system is as tight today as it was before the conversion with our unaccounted for gas about two per cent. Our low pressure system is made up of 15 per cent mechanical joints, 20 per cent lead joints and 65 per cent cement joint pipe. We believe that the lead joints are the only ones that can be affected by dry natural gas. A cement joint is held tight by the cement itself; the little jute used does not function to keep the joint tight as it does in a lead joint.

Napthalene

One unexpected source of trouble was the number of services stopped by napthalene after the conversion. These stoppages occurred only in the old low pressure district of about 12,000 meters served from the plant holder. Prior to conversion a napthalene stoppage was very rare. Our record shows:

By October 1, 1949 this area was converted		
October	1949	No stoppages
November	"	"
December	"	3 "
January	1950	39 "
February	"	63 "
March	"	69 "
April	"	42 "
May	"	64 "
June	"	89 "
July	"	107 "
August	"	104 "
September	"	112 "
October	"	60 "

We found that the number of stoppages were reduced by increasing the amount of hot fogging oil fed into the system but when we increased the rate to five gallons a million cubic feet, the pilot filters started to stop up. On September 29 we started to add crude solvent naphtha at the rate of three gallons a day through a crude feeder in addition to the hot fogging oil at the rate of three gallons a million cubic feet. During October the napthalene stoppages decreased to 60 total or 50 per cent of the previous months. Since then it has continued to improve.

This brief appliance summary is separated into these categories: Ranges, refrigerators, water heaters, house heaters, leaks.

Range complaints have run from a high of 260 per cent of normal in January to a low of 150 per cent of normal in May; for an average of 195 per cent of normal for the first eight months of 1950 considering the 1949 figures normal. Many of these calls were caused by inadequate training of extra conversion men hired too late, and insufficient spot checking on our part.

Refrigerator complaints have varied from a high of 220 per cent of normal in January to a low of 120 per cent of normal in June for an eight month average of 150 per cent of normal for 1950. This increase has been entirely due to by-pass dust stoppages. The pleasant side of the refrigerator story is that flue

(Continued on page 42)

Greeley Gas Co. Wins Denver Ad Club Award

The Denver Advertising Club has honored the Greeley Gas Co. of Greeley, Colorado, with the club's award of the year for "outstanding work in the field of public relations" in Colorado.

The award is made annually and the gas company's program was selected over more extensive and more expensive public relations endeavors by the state's large companies and world-known tourist spots.

The work considered, by the judges, was a three-sided problem created when, within a space of five months, the company changed ownership, found a rate increase necessary, and completely remodeled its old quarters into a modern, new building.

The rate increase was made necessary because of regulations of the pipe line company, the source of Greeley's gas, and the public had to be made to understand that this was the case and that the new ownership and the new building had nothing to do with it; that the increase would have been necessary, anyway.

The job was accomplished without a single petition, and, within only a few months, the people of Greeley have come to think of the gas company's new building as a source of pride to the city.

Left to right: B. J. Jack, Paul Good, Homer Fanning—all of Greeley Gas Co.

The award was presented to Paul L. Good, vice-president and manager of the Greeley company's office, at a luncheon held at the Denver Chamber of Commerce. Copies of the scroll were presented to the Galen E. Broyles advertising agency of Denver and to the agency's account executive on the Greeley Gas Company account, Dorothy Davis Smith.

Index of Yields : Selected Utilities Stocks

	Nov. 1950	Oct. 1950	Sept. 1950	Aug. 1950	July 1950	June 1950	May 1950	Apr. 1950	Mar. 1950	Feb. 1950	Jan. 1950	Dec. 1949
Natural Gas Transmission Companies	5.62%	5.19%	5.71%	5.46%	5.76%	4.86%	4.70%	4.77%	4.57%	4.83%	5.02%	4.75%
Natural Gas Transmission & Distribution Companies	5.46	5.40	5.61	5.71	5.79	5.29	5.11	5.14	5.19	5.26	5.23	5.26
Manufactured & Mixed Gas Companies	5.46	5.24	5.52	5.55	5.76	4.98	4.66	4.77	4.71	4.75	4.62	4.75
Class "A" Electric Companies	6.03	5.56	5.67	5.59	5.64	4.94	5.13	5.24	5.15	5.38	5.40	5.48
Class "B" Electric Companies	6.06	5.99	6.06	6.35	6.41	5.58	5.30	5.37	5.42	5.37	5.47	5.68

Method of Compiling Index of Yields

This is a straight arithmetical index of comparative yields obtainable on a selected group of gas and electric utility industry common stocks.

The companies comprising this index have been selected by the AMERICAN GAS JOURNAL as providing a representative cross-section of each industry, from the standpoint of geographical diversification and of the relative importance of the individual companies in their areas.

No effort has been made to weight the average to give effect to changes in capitalization or in dividend rates because the yields afforded on the issues reflect such changes. The index is designed to show the rate of return and not necessarily market movements on the stocks comprising it.

The companies used in compiling this index are:

Natural Gas Transmission Companies: El Paso Natural Gas Co.; Northern Natural Gas Co.; Panhandle Eastern Pipe Line Co.; Southern Natural Gas Co.; Tennessee Gas Transmission Co.

Natural Gas Transmission and Distribution Companies: Columbia Gas System, Inc.; Consolidated Natural Gas Co.; Lone Star Gas Co.; Oklahoma Natural Gas Co.; Pacific Lighting Corp.

Manufactured and Mixed Gas Companies: Bridgeport Gas Light Co.; Brooklyn Union Gas Co.; United Gas Improvement Co.; Peoples Gas Light & Coke Co.

Class "A" Electric Companies: Boston Edison Co.; Commonwealth Edison Co.; Houston Lighting & Power Co.; Southern California Edison Co., Ltd.

Class "B" Electric Companies: Dayton Power & Light Co.; Hartford Electric Light Co.; Pennsylvania Power & Light Co.; Public Service Co. of Colorado; San Diego Gas & Electric Co.

John F. Falvey

ALL segments of AMERICAN GAS JOURNAL index gave way this month under the pressure of sales by investors seeking to establish tax losses prior to the 1950 year-end.

But while the utility group of stocks has been singled out specifically for this unfavorable attention, the other sections of the market also have been marked by indecision. Despite the fact that both the industrial and railroad stock averages at last report were close to their high of the year, to date their progress has been made haltingly. And the reason is not hard to ascertain. The market for these non-utility equities has been trying to look both ways at once—to go up under the stimulus of rising dividends, and at the same time to hold back until it can measure the uncertainties likely to be created by the forthcoming Federal tax bill and by the effect on business of shortages and rising costs as the country moves further along the road to a war-time footing.

From the standpoint of dividend return the average corporate stockholder has fared well during the current year. According to the latest tabulations 665 corporations have increased distributions to shareholders since January 1, against only 77 reductions or omissions, a ratio of nearly nine to one on the favorable side. This far bettered the record of a year ago when the 387 dividend increases for the corresponding period of the year were only modestly in excess of the 325 reductions or omissions in payments.

The reaction in utility stock prices has not deterred the electric and gas company managements from selling proportionately greater amounts of stock to finance their additions and improvements to properties. No less than 35 per cent of all new utility security offerings during the past month have constituted common stocks and 30 per cent represented preferred shares, or about $2 of stock for every $1 of bond financing.

This turn-about for the utilities duplicates the experience of all industry. During October, for the first time in a year, corporate financing by way of stocks exceeded the total of bond financing. Even though some slight concession has been necessary in a couple of instances to move new bond issues, the average yield on prime utility bonds has contracted slightly thanks to increased buying for trust and pension fund accounts.

The better market performance of industrial company shares of late, in contrast to that for utility equities, reflects the reaction in some financial quarters that they afford a somewhat more promising hedge against inflation.

There is no magic formula, however, for combating inflation, which varies in its impact on the different segments of industry, and even on the individual companies comprising each segment. However high profits and dividend payments may be for any one particular industry at the moment, government controls may negate them over the months and years ahead.

The case against indiscriminate choice of common stocks as a hedge against inflation was stated clearly early last month by Roger F. Murray, vice-president of Bankers Trust Co. of New York, in an address at the Mid-Continent Trust Conference of the American Bankers Association held in St. Louis.

"To me," he said, "the idea of increasing common stocks commitments for the sole purpose of protecting purchasing power is unconvincing by itself; but it may be an important secondary consideration."

Inflation tends to enlarge corporate profits to a much greater extent than it enlarges ability to pay dividends, he pointed out, as he cited the 12½ per cent decline in dividend income on good quality corporate stock issues in relation to purchasing power of the dollar over the past two decades, compared with the decline of eight per cent shown in corporate profits expressed on the same basis.

Keeping one's money working all of the time as a bulwark against inflation makes more sense than any number of theoretical studies, he said, as he indicated the most plausible argument in favor of common stocks as investments is the rate of return differential in their favor compared with bonds and real estate mortgages. "For this to be a valid reason," however, he warned, "it would appear necessary to support a belief that this favorable rate of return will be continued."

Nowhere is this continuity of income more reasonably assured, in the writer's opinion, than it is in the public utility stock classification, now that the various state regulatory commissions in increasing numbers are going on record as favoring a rate making policy which will insure utilities earnings sufficient to attract the additional capital required to finance property additions.

Production and Regulation Discussed At Independent Ass'n Meeting

NEARLY 225 members and guests of the Independent Natural Gas Association attended its annual meeting at Houston on October 23.

Paul Kayser, President of the El Paso Natural Gas Co., was elected President for the coming year.

Other new officers are: C. P. Rather, President of Southern Natural Gas Co., first vice-president, and John F. Merriam, President of Northern Natural Gas Co., second vice-president. Fred W. Peters, treasurer of Oklahoma Natural Gas Co., was re-elected treasurer of the association. John A. Ferguson of Washington, D. C., remains executive director, and Wesley E. Disney, of Tulsa, continues as general counsel.

United States Senator Lyndon Johnson of Texas opened the meeting with a talk centered around the theme: "Production is our greatest weapon." He said that production is the one great hope for victory against aggression, totalitarianism, and communism. He said: "We in America must go on the offensive; we must mount and sustain the greatest production offensive in the history of the world. . . . Guided wisely, our economy . . . can easily sustain half a century of mobilization, and more."

Senator Edwin C. Johnson, of Colorado, emphasized the need of expanding production and of a financial plan that would encourage production in Europe.

Thomas C. Buchanan, vice-chairman of the Federal Power Commission, was the next speaker.

President's Report

During the business luncheon, President Clyde H. Alexander made his report. In reviewing the activities for the past year, he said: "While the presidential veto of the Kerr-Harris bill was a vital blow . . . to the industry as a whole, I hope that our defeat has not been suffered without serving some purpose. I mean by that that we should have learned . . . the lesson that this association and this industry cannot expect to gain public support as long as we fail in our duty to educate the American public concerning the problems involved in this great natural gas business. I am confident that had we undertaken a sound program of public education, going back to the grass roots to help the American people realize the merits of our position, the Kerr-Harris bill would be on the statute books today."

The afternoon session was opened with a round-table discussion of "Common Carrier Natural Gas Pipe Lines." Participating in the discussion were Scott Hughes, vice-president and general counsel, Southern Union Gas Co.; Marshall Newcomb, general counsel of Lone Star Gas Co.; T. J. Reynolds, vice-president and general counsel of Southern California Gas Co.; and Mr. Kayser. The discussion, comparing the evils with the benefits of common carriers, was summed up in Mr. Hughes' question: "Does this common carrier concept offer progress, or merely change and confusion?"

Paul Kayser (right) new INGA President with C. P. Rather, the new vice-president.

The after dinner speaker at the membership party and dinner was Representative Oren Harris, co-author of the Kerr-Harris bill. He said: "I firmly believe in a minimum of government regulation of business necessary to our welfare. Laws and regulations should be provided only in securing the proper discharge of responsibilities one assumes in becoming engaged in a business of public calling."

Domestic Gas Range Shipments Headed for Peaks in 1950

October 1950 was the second highest month in the history of the domestic gas range industry, according to Edward R. Martin, director of marketing and statistics, Gas Appliance Manufacturers Association.

Mr. Martin said that October industry shipments of domestic gas ranges totaled 303,800 units as compared with shipments of 257,500 units in October 1949. The previous "peak month" was established in August 1950, when 331,500 units were shipped.

During the ten month period ending October 31, 1950, industry shipments totaled 2,508,400 units, an increase of 51.4 per cent over the 1,656,500 units shipped during the same period of 1949. During the first ten months of 1948, the industry's "peak" year, 2,416,600 domestic gas ranges were shipped.

Servel's Sales Up 50 Per Cent; 1951 Gain Forecast

Servel increased its sales over 1949 approximately 50 per cent during the 1950 fiscal year ending Oct. 31, W. Paul Jones, President, announced recently. Net sales for the 1949 fiscal year were $41,204,153.

He attributed the big increase over 1949 to the public demand for gas appliances in areas recently opened up to natural gas. He predicted a continued demand for 1951 with the New York market getting natural gas late this year, permission granted for lines to New England which may be ready by next fall, and discussions being held on piping natural gas to the Pacific Northwest.

This continued growth could mean an increase in public demand in 1951 that would send sales up another 50 per cent, he said, if material cutbacks ordered by defense authorities do not interfere too seriously with production plans.

Among the new features in the Servel 1951 line, he said, would be larger models, improved interior storage layout and exterior appearance, scientific cold temperature controls, and a number of other improvements which, he predicted, would make it one of the most advanced lines in the history of the refrigerator industry.

Servel manufactures water heaters and year 'round air conditioners, in addition to refrigerators, and Mr. Jones said that each division experienced a big sales increase.

"Our sales slogan of '50 per cent more in '50' was realized fully in the refrigerator division where the increase totaled exactly that amount," he said.

"These increases were not confined to any one or even a dozen areas but were reported from all parts of the country. Texas reported an increase of nearly 100 per cent with one major city reporting sales up 500 per cent over 1949. Los Angeles sales are up 88 per cent with California as a whole near the 50 per cent mark. The greater Chicago area and Florida both report sales increases equal to the 50 per cent national average and the Atlantic seaboard and the northeast are slightly above this mark."

Pipe Line Construction Begins For Citizens Gas & Coke Co.

United Engineers & Constructors Inc., of Philadelphia, is managing the construction of 26 miles of 16" natural gas pipe line for Citizens Gas and Coke Co. of Indianapolis. Materials for the line are now being delivered, and the field construction work was started early in November.

This line will serve the company's Prospect Street plant from Panhandle Eastern's distribution station northwest of the city. Crossings for Fall Creek and White River are a part of this construction.

United Engineers is also designing and constructing the facilities in the Prospect Street plant for utilizing the gas.

Left to right, seated—Benjamin Asia, legal counsel, International Chemical Workers Union, Local 121; William Gibson, President, International Chemical Workers Union, Local 121; Thomas Bernard, business representative, International Brotherhood of Firemen and Oilers Union, Local 193; J. J. Rohan, business representative, Automobile Drivers and Demonstrators Union, Local 882-B; N. Henry Gellert, President, Seattle Gas Co.; Wendell Straight, business representative, United Association of Plumbers Union, Local 32; Leon Astley, shop steward, Automobile Drivers and Demonstrators Union, Local 882-B; Gilbert Bailey, shop steward, United Association of Plumbers Union, Local 32.

Standing, left to right—M. P. Cullison, director of personnel; Charles M. Sturkey, vice-president and general manager; William F. Lubersky, labor attorney—all of Seattle Gas Co.

Seattle Gas Co. executives and union leaders study results of novel plan.

'Incentive to Vote' Plan Undertaken By Seattle Gas Co. and Unions

THE Seattle Gas Co. recently demonstrated the employer and union's responsibility to the preservation of democracy when H. Henry Gellert, President, announced the "incentive to vote" plan to a meeting of business agents, officers, and attorneys for the labor unions representing the company's workmen.

Under the plan every employe of the gas company, except supervisory employes, were eligible for one-half day's extra pay if he voted in the November 7 election and signed a statement that he had done so.

Although the plan was not announced until after the registration books had closed, the results show that the plan realized its objective of demonstrating the importance of voting and developing good citizenship habits. Ninety-six per cent of the supervisory empolyes, who were not under the plan, voted; 76 per cent of the office employes voted; and of the shop and plant employes, approximately 60 per cent voted. The overall average of those voting was 68 per cent. The percentage of employes not qualified to vote is not known. The total cost of the plan was $1,447.

The labor leaders hailed the "incentive to vote" plan as a splendid example of labor-management teamwork. William Gibson, President of the International Chemical Workers, Local 121, said: "When Mr. Gellert consulted our union on his proposal, we were proud to encourage and approve this contribution."

W. J. Straight, business manager of the plumbers and steamfitters union, local no. 32, said: "The gesture made by N. Henry Gellert, in granting premium pay to insure gas company employes exercising their voting privilege is, in my opinion, an object lesson to employers, as well as employes, that in order for a true democracy to function, all people under that government need to become definitely aware of their privileges whenever and wherever the opportunity presents itself."

This statement was made by Thomas Bernard, international representative of firemen and oilers, local 193: "The Seattle Gas Company's desire to encourage its employes to vote without the exercise of any influence on for whom they should vote is an example of enlightened leadership by management."

The unions cooperating in the plan were Automobile Salesmen, Demonstrators and Drivers Union, United Association of the Plumbing and Pipe Fitting Industry, International Chemical Workers Union, and the International Brotherhood of Firemen and Oilers.

Mr. Gellert considers the plan a sound investment in the future of this country and "our way of life." He believes that any management that is sincerely interested in the preservation of the free enterprise system should consider an employe "incentive to vote" plan. He points out that when a man fails to vote, he not only fails to exercise the greatest privilege of citizenship, but he also endangers the very pillars of democracy.

WHAT PRICE—THE COST OF CAPITAL

YOUR industry cannot be financed for an indefinite period in the future on the rates of return of six per cent and under, and the risk involved in attempting to continue to do so is too great to take. The security markets which reflect the cost of capital fluctuate more every day than these fractions of one per cent about which many regulatory bodies concern themselves.

The setting of a proper rate of return for utilities is a matter requiring considerable artistry, and I question that it can be fully resolved by detailed mathematical formulas. If a proper rate of return on a given property is 6½ per cent, an allowed return of 6¼ per cent can be very serious, as it tends to weaken confidence in the important equity base. On the other hand, a return of 6¾ per cent can do no serious harm to anybody, and it serves to put a desirable margin of safety around your operations.

The moral here is that in an industry which will continue to require billions of new capital in order to render proper public service, it is far safer to err on the high side than on the low side. Otherwise, while industry and the regulatory authorities are engaged in learned discussion as to whether investors should receive six or 6¼ per cent, you may well discover that investors as a group begin to concern themselves as to whether returns should be 10 or 15 per cent. This is not as fantastic as it may sound. The cost of capital to the majority of American industries today, including the banking and insurance businesses which are regarded as relatively riskless, is at least 10 per cent.

By Joseph E. Muckley, vice-president, Seattle-First National Bank, at annual convention of Pacific Coast Gas Ass'n, Seattle, 1950.

News of the Gas Industry

Percy S. Young, 79, Dies; Long With Public Service

Percy Sacret Young, 79, retired chairman of the executive committee of the Public Service Corp. of New Jersey, died recently in Montclair, N. J.

Born in London, he was brought to the United States as a youth and was graduated from New York University in 1908. At the time, he had been in the utility field since 1890, when he began as a collector for Omaha Gas Co. He was with the United Gas Improvement Co., later became assistant secretary of the Hudson County Gas Co., N. J., and was the first comptroller of Public Service when it was formed in 1903. He was a vice-president and director of the utility in 1917-'39, thereafter becoming executive committee chairman.

He had been president of the National Commercial Gas Association, the Eastern States Gas Conference, the American Electric Railway Accountants Association and the American Gas Association, a vice-president of the Edison Electric Institute and treasurer of the National Electric Light Association. He was also a trustee of Rutgers University, member of the council of New York University and a leader in northern New Jersey civic affairs.

H. J. Bauer Becomes Vice-Pres. Of Consolidated Edison

Harry J. Bauer

Harry J. Bauer has been elected a vice-president of Consolidated Edison Co. of New York, in charge of purchasing and stores, fuel and commercial buildings. He will retain his present post as President of the New York Steam Corp., a subsidiary.

The departments reporting to Mr. Bauer formerly were under the direction of John H. Aiken, Con Edison vice-president. Mr. Aiken has taken over direction of the sales and commercial relations activities of Consolidated Edison.

Mr. Bauer joined New York Steam as an engineer in 1928. In 1929 he was made superintendent of stations and in 1935 manager of station operations. Early in 1942 he was elected an assistant vice-president of the company and later the same year vice-president. He has been President of New York Steam since May 28, 1946.

TRANSCONTINENTAL COMPLETES HUDSON RIVER CROSSING TO NEW YORK CITY

Transcontinental Gas Pipe Line Corp. completes Hudson River crossing. The New York City area will receive its first natural gas from this 1840 mile system in January.

Humphrey Is Now Vice-president Of American Natural Gas Co.

Thomas K. Humphrey has been elected vice-president and secretary of American Natural Gas Co., according to an announcement by William G. Woolfolk, chairman of the company.

Mr. Humphrey will have charge of the home office at 165 Broadway, New York 6.

Mr. Humphrey was vice-president and secretary of United Light & Railways Co. until the company recently completed its liquidation.

Truman Named Superintendent Of Manufacturers Light

Elisha R. Truman has been named superintendent of The Manufacturers Light and Heat Co., Pittsburgh, production-transmission division No. 1.

In announcing this promotion, Irving K. Peck, vice-president and general manager, said Mr. Truman had taken over the responsibilities of J. C. Lynn who recently retired after more than 41 years of service with the company. Mr. Truman has been in the employ of the gas company for 19 years.

Mr. Truman will have his headquarters in the company's divisional office in Emlenton, Pa.

To succeed Mr. Truman, Clair E. Davidson advanced to foreman in charge of production-transmission activities in the Kane and Brookville area. Mr. Davidson has been with the company since 1936.

D. R. Meckstroth Selected GAMA Marketing Head

The selection of D. R. Meckstroth, director of sales research, Servel, Inc., Evansville, Ind., as chairman of the general marketing committee of Gas Appliance Manufacturers Association for the coming year, was announced by Frederic C. Hess, President.

L. C. Reese, vice-president and general manager, Armstrong Products Corp., Huntington, W. Va., was selected vice chairman of this committee.

Mr. Meckstroth, who served as vice chairman last year, has been employed by Servel in the sales division since 1941 with the exception of three years duty as an officer in the US Naval Reserve.

MODEL 44 REDUCING REGULATOR

Here's a faithful worker for your general pressure reduction service. Designed to fit the job—in standard or special sizes. Built for years of loyal performance—in cast iron or cast steel. Model 44 meets every specification requirement—backed by Chaplin-Fulton . . . serving the industry since 1885.

Other
CHAPLIN-FULTON PRODUCTS

- pressure reducing regulators
- diaphragm type relief valves
- cut-out latch regulators
- safety valves
- gas-fuel boiler governors
- regulators for compressor control

ACCURATE CF MFG CO. DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 28, Pennsylvania

Norton Company Announces Four Personnel Changes

Territorial changes have been announced for four members of the refractories division of Norton Company, Worcester, Mass., by vice-president William R. Moore.

William F. Winemiller, formerly refractories engineer in Detroit, has been named chief sales engineer, refractories division. He will return to Worcester where he will report to William H. Henson, manager of the refractories sales engineering department.

Eugene A. Fischer has been named refractories engineer for New England and part of New York, with headquarters in Worcester.

Murner E. Thor will take over the territory consisting of eastern Canada and part of New York state. He will work out of Buffalo.

David G. Bolon, who recently completed the refractories sales training course, has been named refractories engineer for the territory which includes the principal part of Indiana and Michigan with the exception of the upper peninsular. His headquarters will be in Detroit.

Rockwell Makes H. Gottwald Assistant Vice-Pres.

H. Gottwald

L. A. Dixon, vice-president of Rockwell Manufacturing Co., has announced appointment of H. Gottwald as assistant vice-president of the company's meter and valve division. For the past year he has been assistant sales manager of the Nordstrom valve division.

Prior to the move into Pittsburgh, Mr. Gottwald was assistant vice-president of the Rockwell International Corp., and in that capacity traveled extensively throughout the Western Hemisphere, handling all products of the Rockwell Manufacturing Co.

Mr. Gottwald started with the company in 1928 as a sales engineer in the New York district office.

Alvin A. Ranshaw Dies; President, Stacey Mfg.

Alvin A. Ranshaw, President and general manager of Stacey Manufacturing Co., died recently.

He was connected with the company for many years and served as President and general manager for the past 20 years.

John F. Shaw, Vice-President, Seattle Gas Co., Is Dead

John Francis Shaw died November 21 after more than a year's illness.

A graduate of Rose Polytechnic Institute in 1928, he went to work for the Freeman-Riff Co., Ind., as chief draftsman. Later he was employed by Indiana Consumers Gas & By-Products Co. as coke sales and traffic manager. In 1933 he started with the Seattle Gas Co. as a coke salesman. At Seattle he became relief plant foreman and plant improvement engineer. Between 1939 and 1942, he was engineer in charge of maintenance and construction at the Lake Union plant. In 1942 he was appointed chief engineer and in 1947 was made vice-president in charge of production and engineering.

Revisions to Be Completed Soon For Appliance Requirements

Revisions to gas appliance requirements affecting central heating equipment, water heaters, automatic pilots, and unit heaters will be presented to the American Gas Association Approval Requirements Committee for final action at its March 1951 meeting.

The subcommittee for central heating appliances will meet during January to review revisions now before the industry for criticism and to consider the comments received. One of the significant changes proposed is the splitting of the text for central heating appliance requirements into two volumes. Volume I would contain the standards for boilers and central heating furnaces, and Volume II those for floor furnaces and recessed heaters.

During October the subcommittees for water heaters, automatic pilots, and unit heaters met at the Laboratories to consider revisions in their respective requirements.

The water heater group adopted revisions which would permit the certification by the Laboratories of water heaters delivering water at 180 degrees F. Such equipment would be required to bear special marking. The committee also decided to issue for criticism a more stringent draw-off test, and requested manufacturers to investigate its feasibility.

The subcommittee for automatic pilots reviewed proposed changes which had been distributed for criticism. These strengthen and upgrade standards to increase the safety of equipment using automatic pilots.

The unit heater subcommittee adopted new tests for efficiency, fire hazard, and draft hood spillage. Several proposed revisions are to be resubmitted to the industry for criticism since changes in the proposed text were made.

Adoption of these new revisions by the Approval Requirements Committee in March will enable them to become effective January 1, 1952.

W. F. Weimer Is Appointed Rockwell Advt. Manager

W. F. Weimer

W. F. Weimer has been named advertising manager of the Rockwell Manufacturing Co. of Pittsburgh effective January 1, 1951. He succeeds Wm. A. Marsteller, who has resigned as vice-president of Rockwell to establish The Marsteller Co., marketing and advertising consultants.

Mr. Weimer has been associated with the Rockwell organization for more than a decade in the gas products sales department, as editor of employee publications, and, for the past several years, as advertising manager of the Pittsburgh Equitable Meter Division.

Active in industrial marketing affairs, Mr. Weimer is secretary of the Industrial Marketing Council of Pittsburgh and chairman of the Exhibits Committee of the National Industrial Advertisers Association.

Establishes New Firm

Mr. Marsteller resigned as vice-president of the Rockwell Manufacturing Co. and as vice-president and director of Edward Valves, Inc., East Chicago, Ind., to establish The Marsteller Co., consultants in marketing and advertising. The new firm will be located at 612 N. Michigan Ave., Chicago, after the first of the year.

Mr. Marsteller has been responsible for advertising, market research and sales promotion for Rockwell and its 14 divisions. Recently in an executive advisory capacity with Edward Valves, he was formerly in charge of sales, advertising and employee relations for this company.

He is a past President of both the National Industrial Advertisers Association and the Chicago Industrial Advertisers Association, and a member of the American Marketing Association, American Statistical Association, and the Association of National Advertisers.

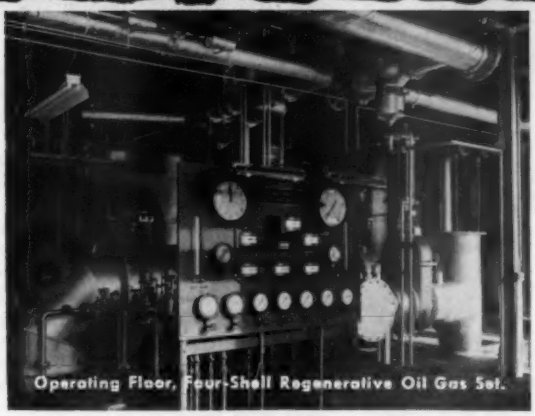
Mississippi Fuel Proposes To Increase Capacity

Mississippi River Fuel Corp., St. Louis, has applied to the Federal Power Commission for authority to install additional compressor units on its pipe line system in Arkansas and Missouri in order to increase the daily capacity of its transmission facilities to 435 million cu.ft. of natural gas. Mississippi recently received temporary authorization from FPC to increase its system capacity to 375 million cu.ft. per day.

Estimated cost of the proposed facilities is $5,500,000.

GASMACO *Oil Gas Processes*

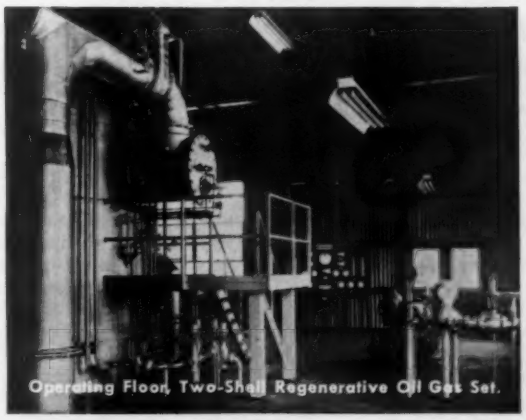
(Patented and Patents Pending)



Operating Floor, Four-Shell Regenerative Oil Gas Set.

Two installations of Gasmaco four-shell regenerative sets are in regular operation. Two more four-shell sets are under construction.

The Know-How and THE EXPERIENCE Counts!



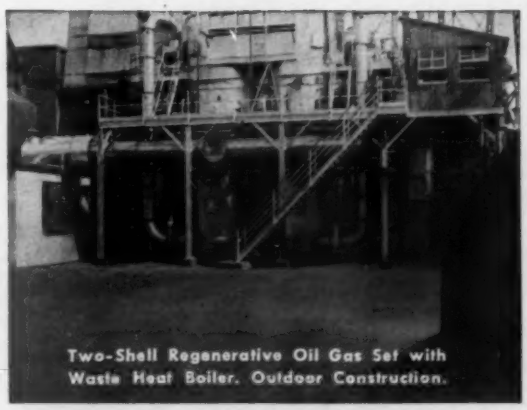
Operating Floor, Two-Shell Regenerative Oil Gas Set.

Five installations of Gasmaco two-shell regenerative oil gas are in regular operation, another is under construction.

Numerous installations of the Gasmaco twin-generator and single generator oil gas process have been giving outstanding service over the past five years.

Approximately 20 installations of this type are now under construction, some modified for heavy high carbon oil.

Operating Floor Comprising Two-Shell and Four-Shell Regenerating Sets; also Twin Generator Oil Gas Sets.



Two-Shell Regenerative Oil Gas Set with Waste Heat Boiler. Outdoor Construction.

Over 110 oil gas sets—of various types, exclusive of Pacific Coast Oil Gas—have been supplied by

Designers • Fabricators • Erectors
Gas Plant Equipment and Industrial Furnaces

THE GAS MACHINERY CO. (Canada) Ltd.
HAMILTON, ONTARIO

THE GAS MACHINERY COMPANY
16114 WATERLOO ROAD
CLEVELAND 10, OHIO

American Gas Association's combined industrial gas exhibit at the National Metal Congress in Chicago, Oct. 23-27, 1950.

Panhandle Eastern Amends FPC Application for Gas Export

Panhandle Eastern Pipe Line Co. of Kansas City has filed an amended application with the Federal Power Commission in connection with its plan to export natural gas to Union Gas Co. of Canada, Ltd., which operates in southwestern Ontario.

Under the new proposal, Panhandle would export approximately 18,250,000,000 cu. ft. of natural gas per year at a daily delivery rate ranging from 25 million to 67 million cu. ft. Base price of the gas would be 27.5 cents per thousand cu. ft.

In its original application filed last March, Panhandle proposed to export approximately 27,350,000,000 cu. ft. per year, or an average of about 75 million cu. ft. per day.

Panhandle would deliver the gas through an existing pipe line crossing under the Detroit River at the International Boundary near Detroit.

Republic Steel Awards Koppers $30,000,000 Contracts

Republic Steel Corp. has awarded Koppers Company, Inc., a contract totaling more than $30,000,000, to build a complete coke oven plant and steel making facilities, including a large open-hearth plant, at its Cleveland district works, Joseph Becker, vice-president and general manager of Koppers Engineering and Construction Division, announced recently.

The contract includes two 63-oven batteries of Koppers-Becker underjet ovens, both of which will be underfired with blast furnace gas, and four 275-ton open-hearth furnaces.

The new coke plant will include all auxiliaries such as by-product and benzene recovery equipment and coal and coke handling facilities.

Work will begin immediately with the view to making steel in the new plant by January 1, 1952.

Bryant Heater Announces New Fan Circulating Heater

Recently displayed for the first time is the new Bryant model 428 fan circulating heater.

The Model 428 features a patented radiant diffuser of concentric louvers which permits the use of a propeller type fan to give draftless circulation and comfortable heating. This new unit also has a cast iron vertical heat exchanger with concentric passages which conform to the air pattern from the fan, resulting in maximum transfer of heat.

The 428 is a cabinet-type heater offering many of the advantages of a central heating plant such as fully automatic controls, room thermostat, limit switch, automatic pilot, humidifier and a manual fan switch for summer air circulation. A cord and plug are furnished for connection to a standard baseboard electrical outlet.

Currently manufactured in one size of 65,000 Btu per hour input, the model 428 has AGA approval for operation on natural, mixed, manufactured and LP-gases. Additional information may be obtained by writing directly to Bryant Heater Division, Affiliated Gas Equipment, Inc., Cleveland 10.

Shipments of Gas Water Heaters Surpass Peak Year

Shipments of automatic gas water heaters during the first ten months of 1950 surpassed the all time record year of 1947 when total industry shipments were 1,800,000, the Gas Appliance Manufacturers Association announced recently. In the ten month period 1,929,200 units were shipped. This was 60.6 per cent greater than during the same period of 1949.

Edward R. Martin, director of statistics and marketing, stated that shipments in October 1950 amounted to 217,300 units and were 40.9 per cent greater than the 154,200 units shipped during the same month of the preceding year.

FPC Authorizes Pa. Gas Storage For Texas Eastern, N. Y. Nat.

The Federal Power Commission has authorized Texas Eastern Transmission Corp. and New York State Natural Gas Corp. jointly to operate an underground storage project in Westmoreland County, Pa.

Under the authorization the two companies will acquire the Oakford storage area from Peoples Natural Gas Co., an affiliate of New York State Natural in the Consolidated Natural Gas Co. system. Estimated overall capital cost of the project is $20,250,129 for New York State Natural and $20,522,791 for Texas Eastern.

The companies plan to inject a total of 105 billion cu. ft. of natural gas into the storage pools, 60 billion cu. ft. of which will be available for withdrawal, with the remaining 45 billion serving as "base storage" gas.

New York State Natural will build a 70 mile, 20 inch pipe line extending from the storage area to a connection with facilities of the East Ohio Gas Co., another affiliate, at the Ohio-Pennsylvania state line.

Texas Eastern, which will construct a 35 mile, 30 inch line, extending from the storage area to a connection with its system in Pennsylvania, plans to sell its storage gas on a spot basis to markets in the eastern part of its system.

According to the plan of development, all of the base storage gas will be delivered by Texas Eastern, and it is expected that the total volume of 45 billion cu. ft. will have been placed in storage by 1955. Title to half of this base storage gas will be transferred to New York State Natural. Each company will provide its own top storage gas, with New York State Natural providing its portion through purchases from Texas Eastern under an existing service agreement.

Nevada Natural Asks FPC OK To Build New Pipe Line

Nevada Natural Gas Pipe Line Co., of Las Vegas, has asked the Federal Power Commission to authorize the construction and operation of a 114-mile pipe line for the transportation of natural gas for resale to distributing companies in Needles, Calif., and Boulder City and Las Vegas, Nev.

The pipe line, estimated to cost $2,331,350, would extend from a point on the east bank of the Colorado River, east of the Arizona-California boundary near Topock, Ariz., and extend northerly to Las Vegas. In addition to the main line, the company proposes to build approximately seven miles of branch lines.

The main line would have an initial capacity of 17 million cu. ft. of natural gas per day. Nevada Natural would purchase natural gas from El Paso Natural Gas Co., and estimates the present potential requirements at 2,237,670,000 cu. ft. per year.

Dodge Sets Building Decline At 19 Per Cent in 1951

Building and engineering contracts will decline 19 per cent in 1951 relative to 1950 in the 37 states east of the Rockies, it is estimated in the annual November outlook of F. W. Dodge Corp. construction news and marketing specialists, as published in *Architectural Record*.

The estimates are authored jointly by Thomas S. Holden, President of F. W. Dodge, and by Clyde Shute, assistant vice-president in charge of the statistical and research division.

"This is a cut-back from the peak construction volume of all time," they state. "It leaves a dollar total measurably greater than that of any year except 1950, and a physical volume total that would compare favorably with other prosperous construction years.

"We question whether there will be much change in the level of construction costs in 1951. Some materials will be tight; others which were tight in 1950 will be plentiful and competitively priced."

The authors employed the phrase "moderate over-all decline" as a subtitle in the article, and attribute "the moderate extent of the anticipated decline" to these reasons, summarized: Partial rather than total mobilization, prospectively increased production of key materials, reduced output of motor vehicles and other consumer durables, ingenuity in conserving and substituting of materials, and the view by "responsible leaders in government that a strong civilian economy with maximum freedoms is just as essential for preparedness as an enlarged military establishment."

Government action in "turning the inflation spigot on and off" is analyzed by Messrs. Holden and Shute, and they base their relatively optimistic viewpoint on their expectation that Regulation X of October 27 will prove to be too drastic and will be modified during 1951.

"Government officials announce the intention of cutting 1951 housing production back one third from the total 1950 volume; from approximately 1,300,000 back to 850,000 new non-farm dwelling units," the writers say. "We incline to the opinion that Regulation X is quite severe and that its effect, unless modified, would be to reduce housing volume considerably more than one third.

"In our estimates we have assumed that Regulation X will be moderated some time next year, if such action proves necessary to produce in 1951 approximately two thirds of the 1950 housing volume. It is our view that 800,000 to 850,000 new non-farm units would adequately meet 1951 housing requirements.

"Single-family houses built on owners' order for owners' occupancy are likely to decline less, percentage-wise, than houses built for sale by operative builders."

The article points out that the government's steps to "reinvigorate the waning postwar housing boom in mid-1949," plus further credit easing in the spring of 1950, added to a free-spending mood of the public, combined to bring about a 1950 housing boom that surpassed all records and all expectations.

"In one important sense that status of the construction industry is radically changed," Messrs. Holden and Shute say. "It has suddenly been superseded by the armament industry as the government planners' favorite vehicle for government spending and for stimulating full employment.

"However, the growth momentum and the prospective expansion of the American economy are so great that a continuously large construction demand may be expected without artificial government stimulation."

Control prospects are uncertain, the writers believe.

"The present prospect is," they write, "that controls will be imposed on a more or less experimental basis. Apparently the dominant thought in responsible government circles today is that controls should be kept to a minimum."

Daniel

FOR ACCURATE, DEPENDABLE ORIFICE METER MEASUREMENT

DANIEL 12-INCH "Flangnek-Junior" Orifice Fittings complete with meter runs, precision fabricated by DANIEL and ready for shipment to one of the largest eastern gas utility companies. Inside diameter of pipe on both upstream and downstream lengths are well within A.G.A. recommended tolerances, enabling the use of basic orifice flange constants and other factors.

DANIEL ORIFICE FITTING COMPANY'S

experienced personnel and facilities assures the user that DANIEL has the "know-how" in gas measurement pertaining to Orifice Fittings and Meter Run design. Many engineering contractors and gas companies specify and select DANIEL Orifice Fittings and Meter Runs. The largest transmission line of them all now being designed and constructed incorporates in its specifications DANIEL equipment. Gas is not only measured for volumetric results, but in dollars and cents, therefore, the user must acquire the very best orifice meter measuring equipment obtainable.

DANIEL PRODUCTS

Orifice Fittings, (Senior, Junior and "Flangnek" Models); Simplex Orifice Plate Holder; Meter Runs (Shop Fabricated); Straightening Vanes; Meter Leveling Saddles; Meter Manifolds; Thermowells; Mercury Traps; Seal and Condensate Chambers; Oil and Gas Separators; Piston Controlled Check Valves; Quick-Operating Valves; Safety (Back-Flow Gate) Swing Check Valves; Vapor Pressure and Specific Gravity Bombs; Orifice Flanges and Pipe Clamps. WRITE FOR COMPLETE 1951 CATALOG OR REFER TO "COMPOSITE CATALOG."

DANIEL ORIFICE FITTING CO.
Incorporated
Main Office and Plant—Los Angeles.
Branches in Houston, Tulsa, Fort Worth, Odessa.
Agents: Malcolm W. Black & Co., New York; Davis & Davis, Denver; Frabimor Equipment and Controls, Inc., Chicago; Clifford B. Ives & Co., Philadelphia; W. H. Kidd & Co., Richmond; A. E. Ehrke & Co., Cleveland; W. A. Stoeltzing Co., Pittsburgh; Sinclair Spence, Apartado 2174, Caracas, Venezuela, South America.

FPC Issues Proposed Amendment To Export-Import Regulations

The Federal Power Commission has issued a notice of proposed rule making which would amend the FPC's regulations under the Natural Gas Act relating to requirements for filing of applications for authorization to export or import natural gas.

The proposed amendment is designed to eliminate the requirement now contained in the Commission's rules that the owner of a source of supply of natural gas who proposes to export or import natural gas or who has entered or proposes to enter into a contract to supply natural gas to be exported or imported shall be a necessary party to an application for the authorization required under the Natural Gas Act.

Kenneth C. Tomlinson Dies On West Coast

Kenneth C. Tomlinson, 58, for the past 15 years Pacific Coast manager of American Meter Company's Pacific Meter Works in San Francisco, died on November 14 while attending the American Petroleum Institute at the Biltmore Hotel in Los Angeles. Mr. Tomlinson had been with American Meter since 1926 and was widely known throughout the industry.

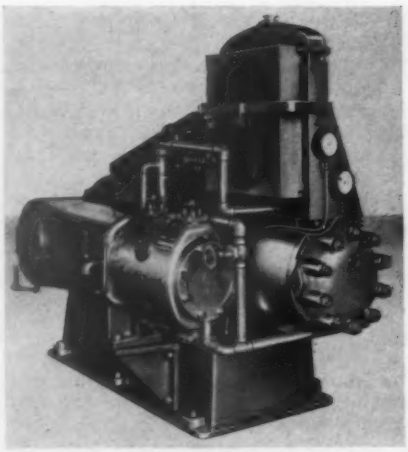
Born in Galesburg, Ill., Mr. Tomlinson's early youth was spent in Portland, Ore., where he attended Reed College, receiving a degree in chemistry in 1915. He then entered the employ of the Portland Gas and Coke Co. as a cadet engineer. Following service in the first World War, he returned to the Portland utility, becoming chief chemist. In 1924 he resigned to become an assistant engineer in the Gas and Electric Division of the California Public Utilities Commission.

FPC Authorizes United Fuel Gas To Increase Storage in W. Va.

The Federal Power Commission has authorized United Fuel Gas Co. of Charleston, to construct and operate approximately 5.5 miles of pipe line and three compressor stations with a total horsepower of 6,460 in connection with the expansion of underground storage facilities in West Virginia.

The facilities, estimated to cost $2,621,061, are part of a program by United Fuel for the development of underground storage facilities enabling it to store volumes of gas received from the southwest in off-peak periods for subsequent withdrawal in peak periods.

The new facilities will allow a total additional 16,995,000,000 cu. ft. to be placed in storage in five West Virginia fields during the first year, and the total deliverability of the five fields on a peak day will be increased from 189,000,000 cu. ft. per day on February 1, 1951, to 272,000,000 cu. ft. on February 1, 1952.



White-Roth Announces New Compressing Unit

A new unit for compressing natural gas or for use in the liquefied petroleum industry or other industry requiring gas under high pressure is announced by the White-Roth Machine Corp., Lorain, Ohio.

Designated by the manufacturer as the Lorain Model A-9 compressor, the new unit is powered by a multi-fuel engine. The single-stage compressor is driven through an overhung crankshaft. This arrangement reduces the 13 inch engine stroke to a 9 inch compressor stroke for high-pressure work and matches the compressor characteristics to engine horsepower output. The compressor cylinder has bottom discharge to prevent accumulation of gas condensates and is equipped with full force-feed lubrication including lubrication of the metallic rod packings.

The compressor is now in quantity production and available for domestic or export markets. The unit weighs 11,100 pounds with standard accessories.

AGA Announces 6.7 Per Cent Gain For September Gas Sales

Total sales of gas by utilities to ultimate customers in September 1950, were 2,757,951,000 therms, an increase of 6.7 per cent over 2,585,670,000 therms sold in September 1949, the American Gas Association has reported. For the twelve months ended September 30, 1950, total sales of gas amounted to 40,075,252,000 therms, a gain of 14.4 per cent compared with 35,041,513,000 therms sold in the comparable period a year earlier. The association's index of gas sales for September 1950 was 254.0 per cent of the 1935-1939 average.

Natural gas sales in September 1950 totaled 2,549,485,000 therms, an increase of 7.5 per cent over 2,372,183,000 therms sold in September 1949. For twelve months ended September 30, 1950, natural gas sales were 36,594,637,000 therms, up 15.7 per cent over 31,616,035,000 therms sold a year earlier. The index of natural gas sales for September 1950 was 273.0 per cent of the 1935-1939 average.

Total sales of manufactured gas during September 1950 were 126,949,000 therms, a decrease of 9.4 per cent under 140,149,000 therms sold in September 1949. For twelve months ended September 30, 1950, manufactured gas sales totaled 2,234,512,000 therms, an increase of 0.2 per cent over 2,230,300,000 therms sold in the same period a year earlier. For September 1950, the index of manufactured gas sales was 119.1 per cent of the 1935-1939 average.

During September 1950, 81,517,000 therms of mixed gas were sold, an increase of 11.2 per cent over 73,338,000 therms sold in September 1949. For the twelve months ended September 30, 1950, total sales of mixed gas were 1,246,103,000 therms, an increase of 4.3 per cent over sales of 1,195,178,000 therms sold in the twelve months ended September 1949. The index of mixed gas sales for September 1950, was 179.6 per cent of the 1935-1939 average.

Increases and decreases in manufactured and mixed gas send-out are influenced considerably by the continuing conversion of utilities from the distribution of manufactured to mixed or natural gas, and from mixed to natural gas. As a result, current manufactured gas data show sales for fewer companies than in the comparable period last year, and current mixed gas sales data are those of a different group of utilities than previously. Data are intended as a measure of changes in amounts of gas distributed rather than of variation in the sales of a specific group of utilities. The Association's index of total gas utility sales is 254.0 (1935-1939 = 100).

Humidifying & Fogging

(Continued from page 32)

cleaning calls have been only 80 per cent and are declining.

The water heater picture is all sunshine; those calls are only 79 per cent of last year.

House heaters were given extra attention as they were serviced with an added post inspection after conversion and our number of calls have no bearing.

Leak complaints for 1950 have run 120 per cent of the 1949 calls and have been influenced by three factors:

(a) Slower ignition on range burners.
(b) Change in gas odor.
(c) Customer resistance to change.

In all of our operating problems since the conversion to natural gas we have been faced with the lack of factual data that will help an operator. The data on humidifying when passing the gas through a wet holder are a small contribution. The balance of the material is a progress report that seems encouraging in solving some of the problems.

BOOK REVIEWS

MODERN REFRACTORY PRACTICE; Published by Harbison-Walker Refractories Co., Pittsburgh, Pa. 439 pages, illustrations and tables. No price given.

This is the third and a completely rewritten edition of Modern Refractory Practice which first was published in 1929, with the second revised edition appearing in 1937. It deals in practical detail with standard shapes and sizes of refractories; their properties, and application to a great number of heat processes. A brief section deals in a general fashion with "The Gas Plant," and contains recommendations for fireclay and high alumina brick suitable for various operating conditions.

GAS PRODUCERS AND GAS FURNACES; by Wilhelm Gumz. Published by John Wiley and Sons, Inc., New York. 316 pages. $7.00.

This highly technical book is in the main devoted to the theory and calculation methods in gasification processes. The gasification processes discussed are largely limited to those having some application to blast furnaces, although the general theory and the fundamental equations should prove useful in any consideration of the fundamentals of gas making for other purposes.

The author is at present a consultant to the Battelle Memorial Institute, Columbus, Ohio.

American Meter Names Weingard Manager of Production

A. E. Weingard

American Meter Co. announces the appointment of Archie E. Weingard as manager of production.

Mr. Weingard first became associated with American Meter in 1947 as supervisor of methods, later being made assistant to the vice-president.

Mr. Weingard is a graduate of the General Electric Technical Engineering School, where he studied engineering, designing, management and analytic subjects. Following his graduation he spent 16 years at General Electric. From 1943 to 1947 he was superintendent of production control at Lord Manufacturing Co.

Arthur H. Forbes Heads AGA Rate Committee

Arthur H. Forbes, rate engineer, The East Ohio Gas Co., Cleveland, has been appointed chairman of the rate committee of the American Gas Association for the 1950-51 association year, it was announced by D. A. Hulcy, President. The Rate Committee's duties include making studies of the various costs involved in supplying gas to different classes of customers and to recommend forms of rates designed to meet most equitable distribution of such costs and at the same time to secure adequate revenue.

Mr. Forbes was graduated from Case Institute of Technology in 1921 with a degree of bachelor of science in civil engineering. From 1921 to 1931, and in 1935 he was in the construction industry, both in the field and on design, on commercial and industrial buildings, steel mills, bridges and power plants. From 1931 to 1934 he was engaged in public utility valuation and rate work on rate cases before the Ohio and Kansas commissions involving The East Ohio Gas Co. and Cities Service Gas Co. Mr. Forbes also did valuation work on the properties of some of the subsidiaries of Associated Gas and Electric Co. He joined East Ohio in 1936, as assistant rate engineer and was promoted to rate engineer in 1947. He also serves as rate engineer for The River Gas Co.

CONVENTION CALENDAR

January

3-5 AGA Home Service Workshop, Hotel Statler, Washington.

17 NEGA Operating Division, Hotel Statler, Boston.

22-25 The American Society of Heating and Ventilating Engineers, Philadelphia.

March

12-14 Mid-West Gas Association, Hotel Fontenelle, Omaha, Nebr.

29-30 NEGA Annual Meeting, Hotel Statler, Boston.

29-30 Oklahoma Utilities Association, Mayo Hotel, Tulsa.

April

10-12 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 GAMA, Annual Meeting, Drake Hotel, Chicago.

May

7-9 Missouri Association of Public Utilities, annual convention, Jefferson Hotel, St. Louis.

keep pipe lines and costs DOWN

Insure stability of pipe lines crossing streams or lakes, prevent movement with current and tendency of line to "buoy up." Rounded construction offers less resistance when snaking pipe into position.

River weights come in two sections, may be easily bolted together after encircling the pipe. Long-lasting concrete weights are more economical. Universal manufactures river weights for most sizes of pipe. Fifteen plants insure swift delivery. Write today.

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Decatur, Alabama • Dothan, Alabama • Atlanta, Georgia • Kenvil, New Jersey • New York City, New York • Syracuse, New York • Port Washington, New York • Rochester, New York • Binghamton, New York Columbus, Ohio • Zanesville, Ohio • Norristown, Pennsylvania Pittsburgh, Pennsylvania • Nashville, Tennessee • New Martinsville, West Virginia • Clarksburg, West Virginia • Wheeling, West Virginia

Collecting Money

(Continued from page 23)

your talks to them, whom you can't do anything with, but that's part of the job. You'll always have them, but if you arrive at a satisfactory understanding with only 50 per cent of the customers you call on, wouldn't that be quite an achievement? These customers then will be paying without any collection costs to the company and irritation to themselves. And let no one think that our disconnection notices have become so routine that they are not a cause of annoyance to most of the people who get them.

We know that it will not be possible to call on all the delinquent customers in one cycle, but that doesn't mean we have to throw up the sponge because it's too big a job which "just can't be done." Let's take a small bite at a time and progressively do the job until all of the delinquent customers have been called on. This represents just a small portion of our total accounts, perhaps at the most 10 per cent, but we need the good will of these people too.

Tests which have been made brought out that some customers were still nursing old gripes which the company representatives were able to settle. It was just a lack of understanding of a certain something which the company had done. Samples of some of the reports of the tests were:

1. "I didn't know your company would bother to send someone out to talk to me about a matter of this kind. I didn't know you cared how I felt. I appreciate your call and shall be glad to pay my bills by the 20th of each month."

2. "Spoke to Mrs. —. She admitted she had been waiting for notice before paying bills. Husband gets paid twice a month. Will mail or bring payment to office on 20th of month."

3. "Spoke to Mrs. —. Husband works for post office. Is paid twice a month. Will pay between 20th and 25th of month."

Just to show you I'm not trying to gild the picture, here's another report:

"Someone at home. Refused to answer. Radio could be heard from outside the door. Coupon returned to action."

Of the small number of customers interviewed during the test, 68 per cent paid future bills within the agreed-upon time after receiving the bill and this percentage returned to the good-pay class.

I should like to challenge each of you to take 100 customers—not the worst customers—but 100 of those customers who are regularly receiving disconnection notices. Send a qualified man to the customers' homes or places of business, who will talk to them privately in a frank, considerate manner, keeping in mind that what he is after is the good will of the customer. He must remember that the object is to get the customer to send his money voluntarily into the office without any expense to the company, to pay for services rendered him.

The test we have previously referred to used two qualified representatives who were carefully schooled in their approach and who knew exactly how they were to conduct themselves with the customer in order to accomplish what we were after. There must be a sincere desire by the company representative to make a friend of the customer and to see that the company is promptly paid for the service it renders. If you will take these 100 accounts and send out qualified representatives, I'll bet you that you will tell me that you were surprised to see how many of your so-called delinquent customers were willing to pay their bills promptly without any pressure from the company.

This practice, which seems so logical to me, is either right or it's wrong, and it will certainly cost you little to try it out. But whether you like the proposed

HOW TO

keep out of the pavement breaking business!

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Elizabeth, N. J. • Los Angeles, California

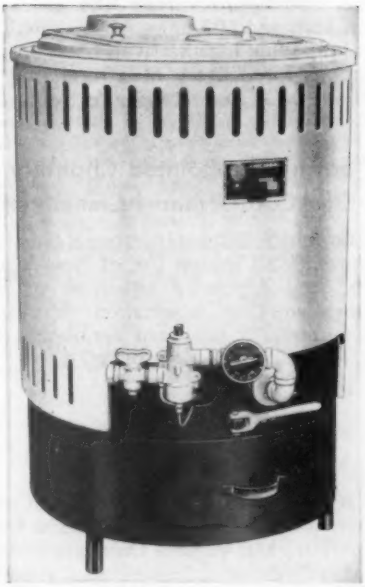
method or not, I'm certain you feel as I do, that the sending of disconnection notices and the subsequent turning off of service is the most undesirable phase of our customer activities. If we do not like this practice, is it not logical then that we should attempt to find some solution? If you don't like spinach, you don't eat it, do you, because you know you can get its vitamins and food value from some other vegetable. In other words, there is another way to get what you want.

What we propose is merely *one* way of helping to correct, or at least minimize, the disconnection practice. No doubt there are a dozen ways to approach this problem.

An Honest Question

But before we decide on our method of approach, just how much do we really dislike this business of threatening the customer with the discontinuance of gas, which is essential to his present way of life? When we reach the point where we dislike telling the customer we're going to turn off his service as much as the customer dislikes having us tell him, it will be then that we shall come up with a policy our customers will buy.

New Automatic Home Incinerator Brought Out by Bowser



An automatic gas-fired home garbage and trash burning unit has been approved by AGA Laboratories for use with natural, manufactured, mixed and liquefied petroleum gases and is now in production at the Cairo, Ill., plant of Bowser, Inc., Incineration Division, according to J. G. Dierkes, general manager.

The new unit, marketed as Incinor Model S-25, has a capacity of two bushels. It is equipped with a thermo-magnetic valve which permits selection of the firing time and turns off the gas automatically when the selected time has expired, eliminating the possibility of forgetting to turn off the gas and the return trip to the unit.

The new model is built with cast iron top, door and grates, and sheet steel firing chamber and convenient ash-removal drawer.

Mr. Dierkes says that deliveries will start at once and the schedule is based upon priority of order acceptance.

Surface Combustion Booklet

One of the newest tools available to the production heat treater, the rotary retort controlled atmosphere furnace, is described in a bulletin just issued by Surface Combustion Corp., Toledo.

These furnaces which have aroused interest in production line heat treating are presented in detail with diagrams illustrating typical production line operation. One of the features of these furnaces is the fact that they permit full automatic operation of the work feeding and processing system.

These furnaces are used for gas case carburizing, homogeneous carburizing, dry cyaniding and clean hardening.

M-SCOPE Pipe Finder

LIGHTWEIGHT MODEL

One Man Operation On Every Application

HIGHLY EFFICIENT

IMMEDIATE SHIPMENT

Free Demonstration and Operating Instructions

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NORWALK SUPERIOR SERVICE REGULATION

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Send for bulletin 7500M. Why not also send us your specifications or tell us your problem? Our products can assure you accurate, trouble-free regulation for years to come.

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Kans.-Nebr. Proposes To Expand To 164,200,000 Cu. Ft. Per Day

Kansas-Nebraska Natural Gas Co. of Phillipsburg, Kans., has applied to the Federal Power Commission for authorization to increase the capacity of its natural gas transmission system from approximately 146,000,000 cu. ft. to about 164,200,000 cu. ft. daily. Estimated cost of the project is $5,201,331.

Pipe line construction plans include 16 miles of 12¾ inch loop and 73 miles of 12¾ inch line replacing a like amount of existing 6⅝ and 8⅝ inch line; approximately 5 miles of 10¾ inch and 54 miles of 8⅝ inch line; about 109 miles of 6⅝ inch and 53½ miles of 4½ inch line; and approximately 101 miles of 3½ inch and 102 miles of 2⅜ inch lateral pipe line together with town border stations for delivery of natural gas for service to 37 communities in Nebraska.

FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...

SKINNER-SEAL Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band—at spigot by hard vulcanized gasket tip.

AND BROKEN MAINS

SKINNER-SEAL Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 800 lbs. line pressure. A lasting repair. 2" to 16" incl.

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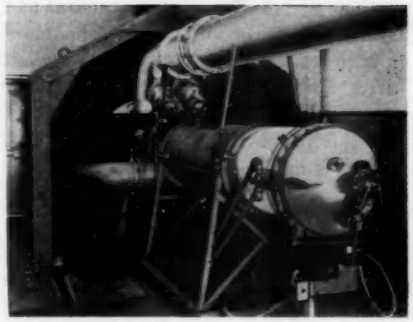
Sargent Appointed Chairman Of AGA Personnel Committee

Dwight S. Sargent, personnel director, Consolidated Edison Co. of New York, has been appointed chairman of the American Gas Association Personnel Committee, it has been announced by D. A. Hulcy, President of AGA.

New Cooper-Bessemer Rig Tests Superchargers

A new development recently put into operation at the Cooper-Bessemer Corporation's Mt. Vernon, Ohio, plant, now makes possible complete performance tests of each exhaust-driven supercharger prior to installation on its engine. Heretofore, manufacturers' tests on such superchargers have been limited primarily to running the superchargers at top speed using steam. Now, however, by means of the testing apparatus designed by this engine builder, each Cooper-Bessemer supercharger is performance run under conditions of loads and temperatures in excess of those on the engine for which it has been built.

More commonly referred to as a "boot strap" tester, Cooper-Bessemer's new rig makes provision for each supercharger to propel itself. In operation, air discharged from the supercharger's centrifugal compressor is directed through an oil fired combustion chamber. The heated air is then piped through the supercharger's gas turbine, driving in turn the same centrifugal compressor unit before being discharged into the atmosphere. Variations of load are determined by the amount of air discharged from the centrifugal compressor. Temperature is governed by the rate of combustion in the heating chamber. Thus any practical combination of operating temperature and load known to exist on a gas, diesel or dual-fuel engine can be duplicated at little expense on the test floor.



New "boot strap" tester developed by Cooper-Bessemer.

The design and construction of its own specially designed supercharger testing equipment marks another phase of this engine builder's program in supercharger research, according to Lawrence F. Williams, assistant to the President.

"Following the decision little over a year ago to design and build its own superchargers in sizes not readily available from outside sources, it naturally became imperative that only the most modern and comprehensive test facilities be designed and built at once to insure maximum possible operating efficiency and dependability of our equipment," Mr. Williams goes on to explain. "As a consequence, the design of the 'boot strap' equipment was one of the first projects assigned to John Fulleman, internationally recognized authority on engine supercharging, who has been heading up Cooper-Bessemer's research and development program in engine supercharging."

Installed in its own experimental building, the new Cooper-Bessemer "boot strap" equipment has complete facilities for remote control operation. Seated at the control panel in an adjoining room with visual and recording instruments conveniently located, the operator can see at a glance the progress of each test.

CLEVELAND

"A" TYPE METERS
"B" TYPE METERS
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The mark of unerring dependability in purification
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Canada May Delay Gas Export To Pacific Northwest

The Province of Alberta is expected soon to announce a "Let's wait for at least a year" attitude toward applications for permits to export natural gas from Canada into the Pacific Northwest.

The *coup de grace* to any hope of early granting of an export permit has been administered by the recent report of the Alberta Natural Gas Conservation Board's own engineer that natural gas reserves of the province now aggregate only 2.88 trillion cubic feet.

This is far less than the province's own estimated requirements for the next 30 years, a market which will have to be adequately provided for before any thought can be given to permitting gas to cross the border.

The questionable gas supply situation, in the opinion of important Canadian observers, precludes even the granting of permission to Pacific Northwest Natural Gas Co. at this time to move the relatively small amount of 100 million cubic feet of gas a day out of Alberta to supply the estimated needs of British Columbia. Another strong deterrent is the thought expressed by Albertans that British Columbia is not the strictly Canadian market that Manitoba and Saskatchewan to the east are considered to be.

Classified

POSITION WANTED

Desiring to change location. Prefer to be located in Mid- or Northwest section. Fourteen years of gas utility experience, managerial or supervisory capacities. Good record of productiveness. Thirty-seven years old. Address replies to Box 224, c/o American Gas Journal, 205 East 42nd Street, New York 17, N. Y.

Perks Is President of Eclipse Fuel Engineering

A. C. Perks has been elected President and general manager of Eclipse Fuel Engineering Co., Rockford, Ill. He was formerly executive vice-president.

H. P. Howell, formerly President, was elected chairman of the board.

MAN WANTED

If you are a graduate engineer or equivalent and have had experience in the design and development of gas heating equipment—here is an excellent opportunity for you. Our Company is located in New England, we are one of the pioneer firms in the manufacture of automatic heating equipment. Our products are nationally advertised and sold by a thousand dealers across the country. We now have a position open for a project engineer with experience in design, development, and application of domestic gas heating equipment. He should be familiar with AGA and Utility requirements, and a self-starter who can prosper with us because he will get things done. He can advance to bigger things in our Company because we are still growing (we have had 5 plant expansions since the end of the war and we are solid financially). The starting salary will be commensurate with his experience. He writes his own ticket from then on. Write us, giving full resume of experience and salary expected. Address Box No. 225, c/o American Gas Journal, 205 East 42nd Street, New York 17, N. Y.

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Complete engineering and installation service for coal and coke handling, screening, crushing, skip hoists and storage bins, including alterations to existing conveying and screening plants.
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MORE THAN FORTY-FIVE YEARS OF SOUND
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GAS HOLDERS PURIFIERS

Army Uses 'Miracle Flame' In Japanese Reorientation

The Pacific Coast Gas Association reports that its motion picture, "The Miracle Flame," borrowed last spring by the Department of the Army, has served as a useful feature in the reorientation program in Japan.

The print, recently returned, was accompanied by a report indicating that the film was shown at least 17 times to audiences totalling over 3000 persons.

One comment made by an official of the Tokio Gas Co. reads: "It is not by haphazard but by the application of intellect and effort that natural gas has become an indispensable item in American life. We have been thus favorably impressed. We have learned from the picture a great deal indeed."

Gas To Be Sold To Republic By Tenn. Gas Transmission

The Federal Power Commission has authorized Tennessee Gas Transmission Co. of Houston to construct a sales meter station on its main line in Chautauqua County, N. Y., for the sale of natural gas to the Republic Light, Heat and Power Co., Inc., of Buffalo.

Tennessee plans to sell a contracted demand quantity of 600,000 cu. ft. of natural gas per day to Republic, which will resell the gas in Mayville, Westfield and Chautauqua, N. Y.

At the hearing on the Tennessee proposal, the Cities of Ripley, Booneville and Baldwyn, Miss., opposed the granting of authorization for service to Republic until after disposition of their pending application in another proceeding for an FPC order directing Tennessee to supply gas to meet their requirements. The Commission said, however, that the record shows that there will be available approximately 2,012,000 cu. ft. of gas per day from Tennessee's system after service to all presently authorized customers, including the newly-authorized service to Republic.

Jones Becomes Gas Engineer For New England Power

The appointment of Herbert C. Jones as gas engineer for New England Power Service Co. with headquarters in Boston was announced recently.

From 1913 to 1920 Mr. Jones was employed by the Grand Rapids Gas Light Co. as draftsman, assistant chemist, plant foreman and superintendent of construction. The following year he was superintendent of plant and distribution for the Emporia Gas Co. in Kansas.

In 1921 Mr. Jones joined the Gas and Electric Improvement Co., part of Massachusetts Lighting Co., as gas engineer. When these companies became a part of New England Power Association in 1933, he became an engineer with the Engineering and Service Corp. He has been assistant gas engineer for the Service Co. for almost one year.

He is a past chairman of the Gas Production Committee of the American Gas Association.

Adams Is Department Manager Of Texas Eastern Prod.

J. K. Adams, of Houston, has been appointed manager of Texas Eastern Production Corporation's land and lease department, the company announced recently. Texas Eastern Production is the exploration and producing subsidiary of Texas Eastern Transmission Corp.

Mr. Adams was formerly with the Mills Bennett Production Co. of Houston and other Mills Bennett organizations. He engaged in pipe line, production, and land and lease operations for these companies from 1929 to 1950.

He was a sales representative of the Timken Roller Bearing Co. from 1925 to 1928, and during World War II he served as a contracting officer in the Air Force.

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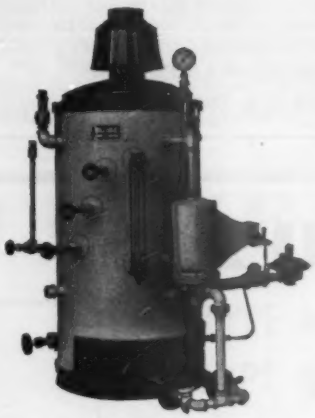

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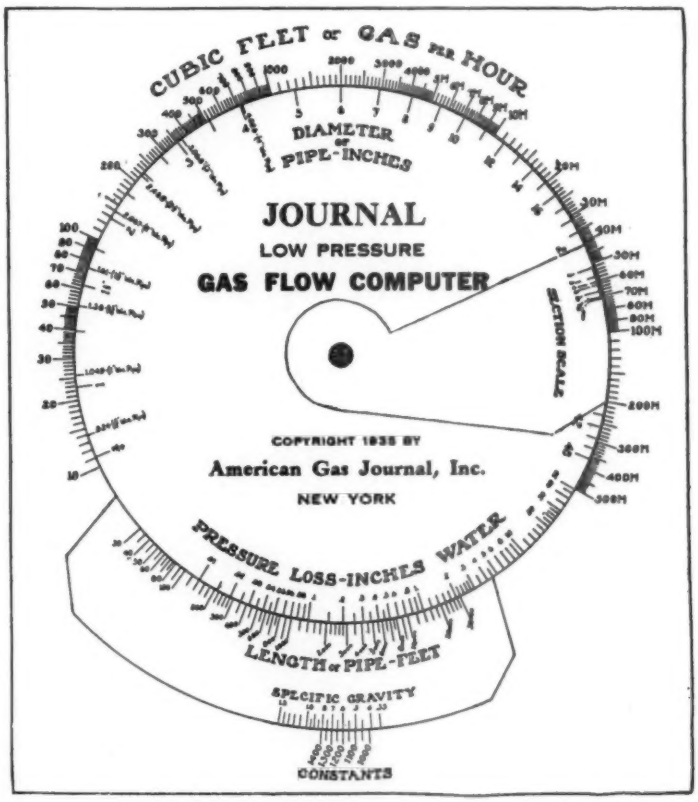

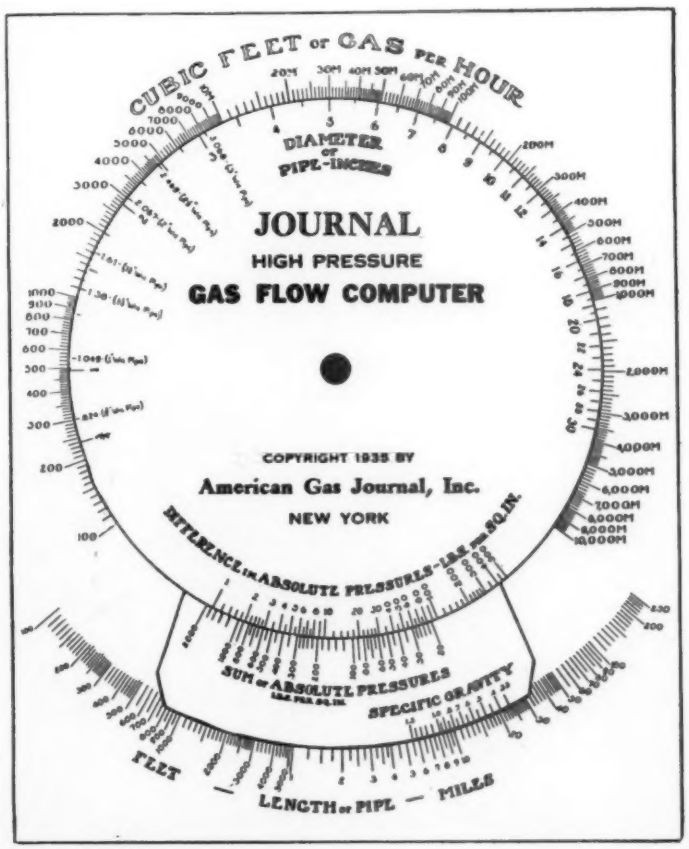

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